



NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

**UNITED STATES MARINE CORPS RESERVE FIRST
TERM ATTRITION CHARACTERISTICS**

by

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March 2012

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REPORT DOCUMENTATION PAGE			<i>Form Approved OMB No. 0704-0188</i>	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE March 2012	3. REPORT TYPE AND DATES COVERED Master's Thesis	
4. TITLE AND SUBTITLE United States Marine Corps Reserve First Term Attrition Characteristics			5. FUNDING NUMBERS	
6. AUTHOR(S) Philip R. Herschelman				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government. IRB Protocol number _____N/A_____.				
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited			12b. DISTRIBUTION CODE A	
13. ABSTRACT (maximum 200 words) <p>This thesis examines the effect of attrition on USMCR NPS marines who enlisted with a 6X2 contract in FY 1994–2005. Three cohorts were established to determine if the events of September 11, 2001 had any impact on attrition rates with this population. The Pre-9/11 cohort enlisted in FY 1994–1995 and was used as a control group. The Overlap-9/11 cohort enlisted in FY 1996–2001, had no expectation of deployment but many did deploy in support of the Global War on Terrorism. The Post-9/11 cohort enlisted in FY 2002–2005 after 9/11 with full expectation to deploy.</p> <p>The analysis included previous attrition studies, descriptive statistics, and two different probit regression models to determine the effects of various characteristics on attrition. The variables analyzed included deployment variables, demographics, education and aptitude variables, and regional areas.</p> <p>The thesis found a decrease in attrition from the Pre-9/11 cohort to the Post-9/11 cohort. This was most likely caused by an increasing unemployment rate and deployments overseas. Deployments to combat areas decreased the probability of attrition. The other variables remained constant throughout the cohorts with predicted results. Overall, attrition is lower after 9/11 but as the economy improves and deployments decrease, attrition could return to Pre-9/11 levels.</p>				
14. SUBJECT TERMS Attrition Rate, Attrition, Retention, SMCR, Activation, Deployment, Mobilization, Marine Corps Reserve, USMCR, Probit Regression, Multivariate Analysis, Statistical Analysis, Non-Prior Service, Pre-9/11, Post-9/11			15. NUMBER OF PAGES 87	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UU	

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. Z39-18

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**UNITED STATES MARINE CORPS RESERVE FIRST TERM ATTRITION
CHARACTERISTICS**

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Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

**NAVAL POSTGRADUATE SCHOOL
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ABSTRACT

This thesis examines the effect of attrition on USMCR NPS marines who enlisted with a 6X2 contract in FY 1994–2005. Three cohorts were established to determine if the events of September 11, 2001 had any impact on attrition rates with this population. The Pre-9/11 cohort enlisted in FY 1994–1995 and was used as a control group. The Overlap-9/11 cohort enlisted in FY 1996–2001, had no expectation of deployment but many did deploy in support of the Global War on Terrorism. The Post-9/11 cohort enlisted in FY 2002–2005 after 9/11 with full expectation to deploy.

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LIST OF ACRONYMS AND ABBREVIATIONS

AC	Active Component
AIM	Assessment of Individual Motivation
ANG	Army National Guard
AR	Active Reserve
ASL	Active Status List
CONUS	Continental United States
DoD	Department of Defense
FMCR	Fleet Marine Corps Reserve
FY	Fiscal Year
GED	General Equivalency Diploma
HFP	Hostile Fire Pay
IMA	Individual Mobilization Augmentee
IRR	Individual Ready Reserve
ISL	Inactive Status List
MOS	Military Occupational Specialty
MSO	Military Service Obligation
NPS	Non-prior Service
OCONUS	Outside of the Continental United States
PEBD	Pay Entry Base Date
PFT	Physical Fitness Test
PRO/CON	Proficiency and Conduct scores
PS	Prior Service
ROEP	Reserve Optional Enlistment Programs

SelRes	Selected Reserve
SMCR	Selected Marine Corps Reserve
SNCO	Staff Noncommissioned Officer
TFDW	Total Force Data Warehouse
USAR	United States Army Reserve
USMC	United States Marine Corps
USMCR	United States Marine Corps Reserve
HS	High School
HSD	High School Diploma

ACKNOWLEDGMENTS

There are a multitude of individuals I would like to thank for the support, mentorship, and counseling during the writing of this thesis. First and foremost, I would like to thank my advisors, Professors Stephen Mehay and Jeremy Arkes. Your wisdom, guidance, patience and understanding will forever be appreciated. Your professionalism and ability to instruct is an invaluable asset to the Naval Postgraduate School. Students are fortunate to have the opportunity to learn under both of your superior tutelage.

This thesis would not have started if it weren't for the guidance and support of LtCol Jonathan Price. Thank you for providing the background, the data, mentorship and a couple of all-nighters of your personal one on one time to help me with this thesis in both Quantico, VA and Monterey, CA. Your leadership, commitment and unselfishness are awe inspiring and examples for all to follow.

I would also like to thank the support network throughout the Naval Postgraduate Campus. Joan Murray, you're a life saver. You were able to retrieve a whole section of my thesis which I thought was lost in cyberspace. I don't know how you found it, but you saved me weeks of work. In addition, Joan and other staff at ITACS responded to countless computer related questions which were quickly and kindly solved. All the NPS library staff was fantastic with their research related support, especially Ann Jacobson, who gave numerous invaluable classes to help prepare and guide all the students in the thesis process. I am indebted to Katie Murphy in the thesis processing office for providing outstanding support under stressful time constrained deadlines, helping me complete the thesis in a professional manner.

Lastly, I would like to thank the students and instructors who I have been privileged to associate with from June 2010 to March 2012 at the Naval Postgraduate School, Monterey, CA. This experience has been wonderful and fulfilling because of the relationships we have developed. Finally, to my dear wife Christina, thank you for your sacrifice, patience, understanding, and love. Without your support, this thesis would not be possible.

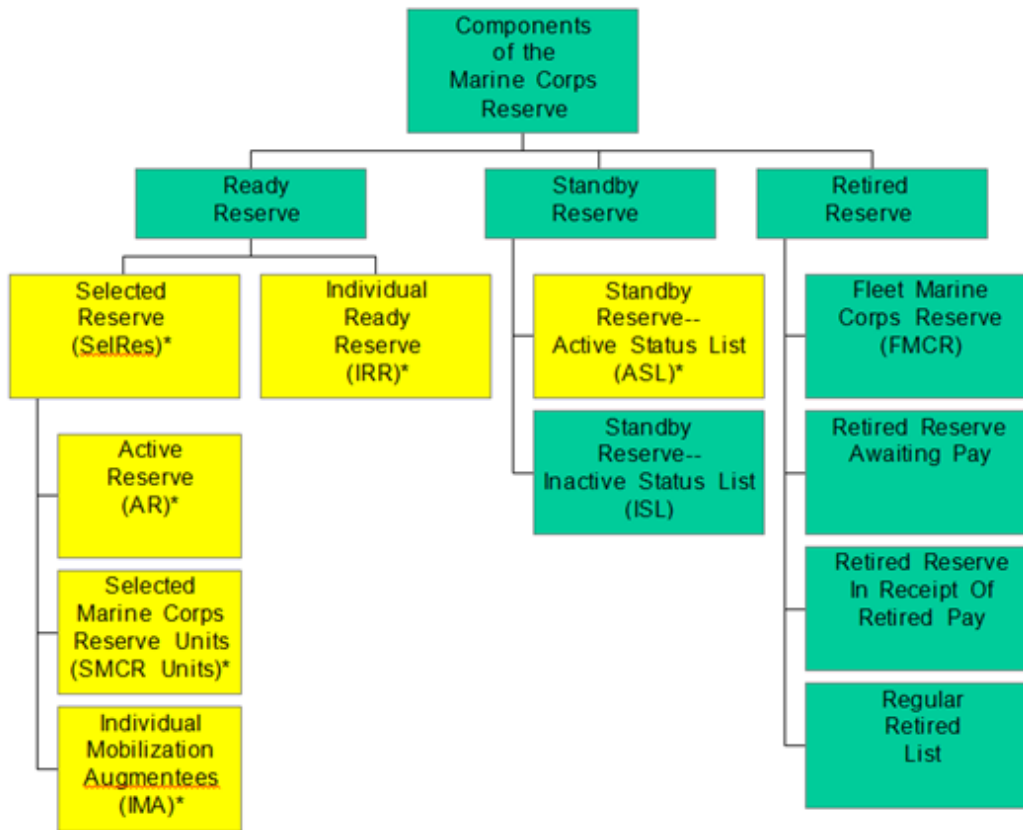
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I. INTRODUCTION

The goal of this thesis is to determine the determinants of attrition on the United States Marine Corps Reserve (USMCR) non-prior service (NPS) marines with a 6X2 contract who enlisted from 1994 through 2005. The analysis revolves around the events of September 11, 2001 to determine if characteristics of the population related to attrition are different before and after the terrorist attacks on the American homeland. The population is divided into three cohorts; the Pre-9/11 cohort (used as a control group) enlisted in FY 1994 and 1995 and completed their 6-year obligation prior to 9/11, the Overlap-9/11 cohort (had no expectation of deployment) enlisted between FY 1996 and 2001 (before 9/11) and whose 6-year commitment expired sometime after 9/11, and the Post-9/11 cohort (expected to deploy) enlisted in FY 2002–2005 after 9/11. Numerous variables are analyzed including, deployment characteristics, demographics, education and aptitude variables, and regional differences.

The thesis consists of six chapters. Chapter I is an introduction and background of the USMCR. Chapter II is a Literature Review of previous studies, focused on active duty and reserve attrition. Chapter III is the definition of all the variables which are discussed in the analysis. Chapter IV is the beginning of the analysis with summary statistics of the data collected on the reservists. Chapter V is the regression analysis using probit models to predict the effects of various variables on attrition. Lastly, Chapter VI concludes the thesis with the results and recommendations from the findings of this thesis.

COMPONENTS OF THE MARINE CORPS RESERVE



Note: Components highlighted in yellow (*) are elements of the RASL.

Figure 1. Components of the USMCR (From MCO 1001R.1K, 2009, March)

A. RESERVE STRUCTURE AND ORGANIZATION

As depicted in Figure 1, the Marine Corps Reserve is composed of three main components: The Ready Reserve, the Standby Reserve, and the Retired Reserve. The mission of the Reserve Component of the Marine Corps Total Force is to augment and reinforce the Active Component (AC) with trained units and qualified individuals in a time of war or national emergency, and at such other times as national security may require. The Marine Corps Reserve complements the Marine Corps operating force structure and capabilities and is able to increase the size of the Marine Corps when called upon increasing the capability, flexibility, and depth to the force.

The reserves main focus is on planning, training, and administration for total force integration in the event of a recall and mobilization. (MCO 1001R.1K, 2009)

1. Ready Reserve

The Ready Reserve is composed of the Selected Reserve (SelRes) and the Individual Ready Reserve (IRR). These are the reservists who are liable for immediate recall to active duty in times of national emergency or war.

a. Selected Reserve (SelRes)

The Selected Reserve consists of approximately 39,600 marines and is comprised of three components: the Active Reserve (AR), the Selected Marine Corps Reserve (SMCR) and Individual Mobilization Augmentees (IMA). The Active Reserve currently consists of approximately 2,261 reservists who serve full time multi-year contracts similar to the Active Component (AC) and are responsible for the organization, administration, recruitment, retention, instruction and training of members of the Marine Corps Reserve. (Flynn, 2011) The SMCR includes the vast majority of the SelRes and is comprised of part-time reservists who generally drill one weekend a month and have a 2 week annual training event once a year. IMA reservists are marines from the SelRes who serve in a full-time capacity with the active component. The IMA contracts are short term, usually 1 year, and support the active components mobilization requirements to include combat operations and/or training.

b. Individual Ready Reserve (IRR)

Most AC marines enlist with a 4X4 contract representing 4 years of active service and 4 years of Military Service Obligation (MSO) in the IRR. Most reservists enlist with a 6X2 contract with 6 years of service in the Ready Reserve and 2 years of MSO in the IRR. The Individual Ready Reserve consists of marines who have previously served in the AC or the SelRes and are available for mobilization, have had training, and either have not completed their Military Service Obligation (MSO) or have completed their MSO and volunteered to remain in the Ready Reserve.

The purpose of the IRR is to have an additional pool of marines available for the President to call upon in case of a national emergency. Unless activated, members of the IRR only need to muster once a year and do not drill otherwise.

2. Standby Reserve

The Standby Reserve is a pool of marines who are not required to train and are not members of specified units, but can be mobilized with the Secretary of Defense's approval as needed in the event of a national emergency. It consists primarily of officers who are unable to meet participation requirements of the Ready Reserve but desire to maintain affiliation, or who are still obligated contractually or fail to resign their commissions. There are two categories of Standby Reserve: Active Status List (ASL) and Inactive Status List (ISL). The ASL consists of marines who are designated as key federal employees or have been temporarily assigned due to hardship but intend to return to the Ready Reserve. ASL marines are in an active status for purposes of promotion and are eligible to participate in reserve training programs for retirement point credit, but do not receive pay or allowances. The ISL consists of reserve officers who desire to maintain their reserve affiliation but who have failed to meet the minimum requirements. ISL Marines are not eligible to participate, receive pay or retirement credit, or promotion consideration. (MCO 1001R.1K, 2009)

3. Retired Reserve

The retired reserve consists of Marines who have completed at least 20 years of active or qualifying reserve service and requested and been approved for retirement. The four categories of retired reserve Marines are: Fleet Marine Corps Reserve (FMCR), Retired Reserve Awaiting pay, Retired Reserve in Receipt of Retired Pay, and the Regular Retired List. Marines in the retired reserve may be recalled to active duty according to Section 688 of United States Code Title 10.

4. Non-Prior Service Reservists.

Because of the scope of this thesis, only non-prior service (NPS) enlisted Marines in the Selected Reserve will be analyzed. Prior Service (PS) Marines, Officers, the

Standby Reserve, and the Retired Reserve are not relevant to the analysis in this thesis. Non-prior service (NPS) enlisted Marines are recruited into the USMCR through one of four Reserve Optional Enlistment Programs (ROEP). Each program imposes an eight year contract but the amount of time spent drilling in a SMCR unit and time spent in the Ready Reserve differs. Table 1 describes the requirements for each ROEP. The overwhelming majority of ROEP contracts are the 6X2 with over 97 percent of all ROEP contracts so designated. (Lizarraga, 2011)

Table 1. Reserve Optional Enlistment Program Contract Type (From Lizarraga, 2011, March)

Contract Type	Contract Details
3X5	3 years drilling in the SMCR and 5 years remaining in the Ready Reserve
4X4	4 years drilling in the SMCR and 4 years remaining in the Ready Reserve
5X3	5 years drilling in the SMCR and 3 years remaining in the Ready Reserve
6X2	6 years drilling in the SMCR and 2 years remaining in the Ready Reserve

5. Current Trends of Reserve Activation.

Operation Desert Shield/Storm in 1990/1991 was the culminating point of a new era of reserve participation in global military operations and humanitarian efforts. Politically, Americans' support for military operations is almost essential to employ forces. By employing the reserves, it ensures Americans across the country are directly connected to the conflict through friends, relatives, and acquaintances serving with the Reserve Components or National Guard. Desert Storm in 1990/91 and Operations Enduring Freedom and Iraqi Freedom since September 11, 2001 have demonstrated the overwhelming support of the conflicts (at least initially) due in part to reserve participation. The USMCR has had on average 6,927 SelRes Marines on activation orders from September 2001 through September 2009. Figure 2 depicts the trends of USMCR activation showing a peak in April 2003 of 17,807 USMCR marines on activation orders. (Price, 2010)

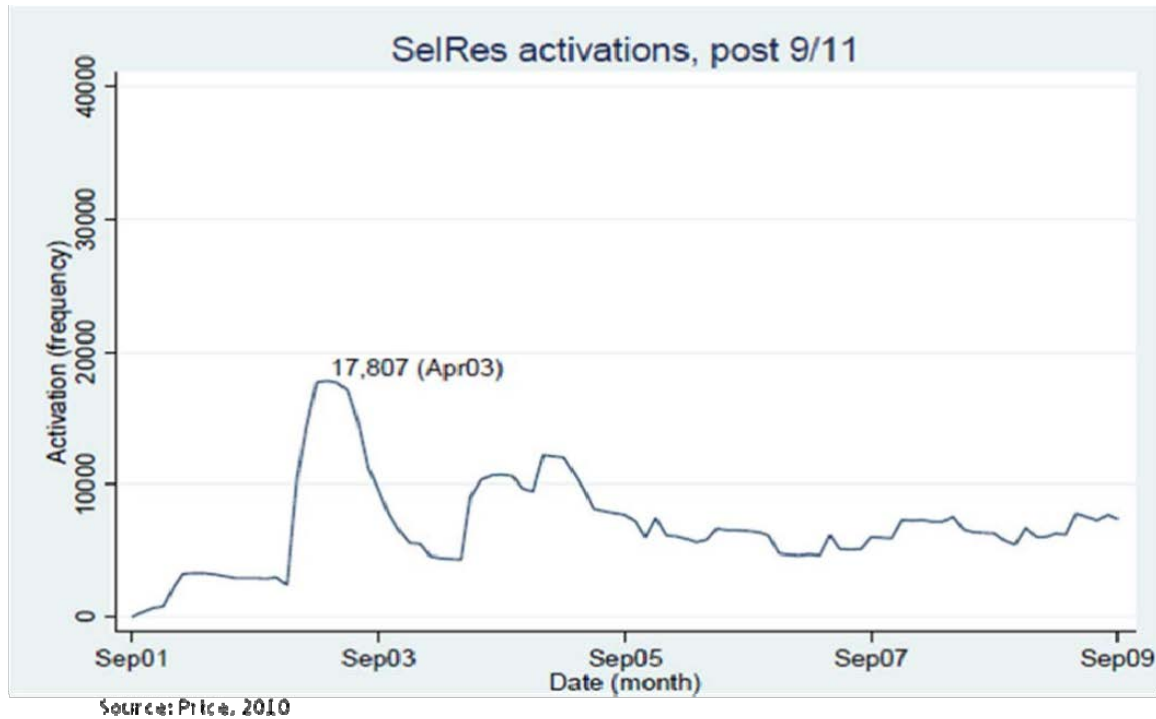


Figure 2. Post-9/11 Frequency of SelRes Activations (From Price, 2010)

As identified by Price (2010), the Marine Corps failed to meet its congressionally mandated Selected Reserve end strength of $39,600 \pm 3$ percent in Fiscal Year (FY) 2007 and 2008 and just eked above the lower limit of 38,412 Marines in FY 2009. These shortcomings can be attributed to the rapid expansion of the active duty force from 175,000 in FY 2006 to 202,000 by FY 2011, which took away potential reserve contracts. Lizarraga (2011) discusses other problems needing to be addressed by the Reserves. Figure 3 shows the NPS enlisted 6X2 contract attrition and continuation behavior in the post 9/11 era.

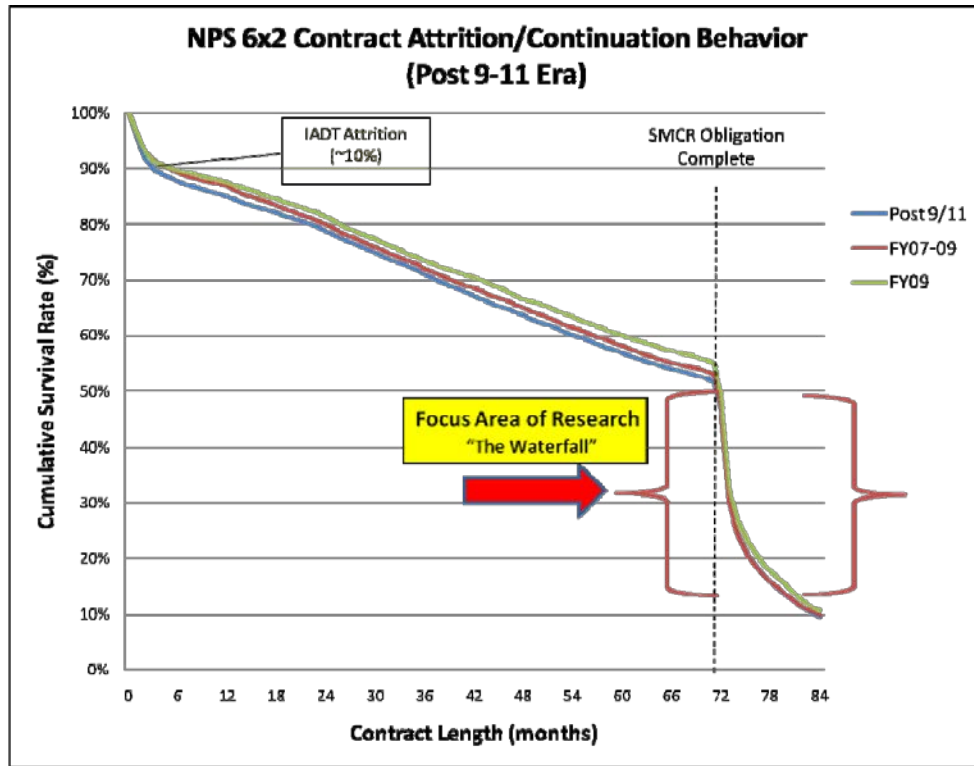


Figure 3. NPS Continuation Behavior Graph (From Lizarraga, 2011, March)

The 12-month continuation rate of those marines who complete 6 years of service is less than 20 percent. In addition, the attrition rate of the marines during their 6-year obligation is approximately 45–48 percent. Thus, only 10 percent of NPS enlisted marines enlisting with a 6X2 contract remain with their SMCR unit after 7 years. This creates a vacuum for experienced Staff Noncommissioned Officers (SNCO's) and requires additional resources for recruiting efforts to replace those who attrite or choose not to continue with the reserves. The attrition of those who sign up with a 6-year contract is a contributing factor to the USMCR missing end state goals. By analyzing the attrition of NPS enlisted marines, the goal of this thesis is to identify characteristics of those who attrite and implement recommendations in order to reduce the attrition and allow the individuals to successfully complete their contracts.

There are a number of reasons why a Marine may attrite during his/her first term. These reasons can be categorized into "acceptable attrition" and "wasteful attrition." Acceptable attrition occurs when an individual leaves a specific SMCR unit but the

Marine Corps retains the individual in other capacities. An example of acceptable attrition is when a marine accepts an Individual Mobilization Augmentee (IMA) billet to work with another mobilized unit for a specified period of time. Marines also may leave their SelRes unit early if they are accepted in a USMC Officer program, if they transition to the active duty forces, conduct an Inter Unit Transfer, or are accepted to the Active Reserve (AR) program. All of these circumstances warrant a loss for the SelRes unit but a gain to other USMC programs. Attrition is considered wasteful when members are kicked out of the Marine Corps for disciplinary or legal problems. Medical discharges are also wasteful because they are unforeseen early departures from contracts which impact end strength. Transfer to another service branch is also undesirable attrition because it demonstrates disenfranchisement or the lack of the Marine Corps to satisfy the individual needs. Due to data constraints, there is no way to differentiate between acceptable and wasteful attrition and thus both are lumped together as attrition.

II. LITERATURE REVIEW

This chapter examines previous studies pertaining to attrition in the military. Attrition studies are prevalent so only attrition studies pertaining to first term enlisted attrition are included in this thesis with a focus on reserve components of the military. Attrition in the Army Reserve, National Guard, Air Force Reserve, Air National Guard, Navy Reserve and Marine Corps Reserve have all been previously addressed with emphasis on a number of factors.

A. ATTRITION STUDIES

Numerous Attrition studies have been conducted concerning the Active and Reserve components of the U.S. Military. Doering and Grissmer (1985) related reserve attrition to major intervening events such as full time work commitments, change in marital status during enlistment, birth of children, and migration. When reservists experience major intervening events in their life, they are more likely to attrite. (Doering & Grissmer, 1985)

Grissmer and Kirby (1985) followed the FY1980 cohort of Army Reserve and Army National Guard NPS enlistees for the first two years of their enlistments to study attrition. They found attrition of 30.6 percent for the National Guard and 39.5 percent for the Army Reserve. Reasonable extrapolations through the six-year enlistment term predict an overall attrition rate of 60 percent for guardsmen and 75 percent for Army reservists. The high rate of attrition is attributed to three factors: the quality and demographic composition of the cohort; transfers to the active force or to other reserve components; and the turbulence of normal civilian life. Attrition rates were higher for those with lower Armed Forces Qualification Test (AFQT) scores and those without High School (HS) diplomas. Women have attrition rates twice that of men with similar AFQT scores, education, and other characteristics. This is believed to be related to earlier marriage and more frequent spousal conflict as well as more frequent geographical moves and childbearing. Those separating to pursue careers in the Active Component equate to approximately 20 percent of the Reserve separations, and 13 percent of the Guard

separations. These enlistees going to the Active Component are found to be significantly higher quality than the other separations. The separations related to changes in reservist's civilian life are hypothesized to be related to migration for new civilian job opportunities, new marriages and/or increased family size. (Grissmer & Kirby, Attrition of Nonprior-Service Reservists in the Army National Guard and Army Reserve, 1985)

As a follow up to their previous study in 1985, Grissmer and Kirby (1988) looked at multiple cohorts from 1980–1982 to study attrition in the US Army Reserve (USAR) and Army National Guard (ANG). This time, they concentrated only on those who left the service to the civilian sector. Once again, women had a much higher attrition rate than males (44 percent compared to 18–28 percent). This is possibly due to women migrating more often and changing jobs and marital status more frequently than men of similar age. In addition, it is believed that pregnancy and added responsibilities/expectations of taking care of home and children also impact women's decisions to stay with units.

To improve upon the previous study, Grissmer and Kirby identified and tracked important manpower policy changes which could affect attrition, including training standards, attrition discharge policies, and binding budget and end strength constraints. In addition, it is important to understand how changing cohort size or quality is affected by training. Because some training is graded using bell curves, a smarter cohort may result in attrition of those with higher AFQT scores.

Although attrition increased from one cohort to the next, the individual characteristics related to attrition did not change over time. They concluded that recruiting and training policies can focus on individual characteristics to improve efficiency. (Grissmer & Kirby, Changing Patterns of Nonprior Service Attrition in the Army National Guard and Army Reserve, 1988)

Kirby and Grissmer (1993) readdress previous studies and include the two year NPS attrition of the Air National Guard, the Air Force Reserve and the Marine Corps Reserve along with the Army National Guard and Army Reserve. They expanded the analysis to include cohorts from FY 1982–1988. The study acknowledges that attrition to

the active component or the selected reserves maintains a return on investment so only the attrition to the civilian sector is looked upon negatively. The five-year attrition rates were determined to be highest for the Marine Corps and lowest for the Air Force Reserve and Air National Guard. These differences are believed to be a function of the inherent, unmeasured characteristics of the components themselves or the types of individuals they attract. When comparing the reserve attrition to the active component for both one year and four years of service, the attrition is comparable. In addition, attrition has seen a decline as each cohort progresses. This is hypothesized to be the result of an increased quality of recruits, the introduction of the Montgomery G.I. Bill in 1984, investment of substantial resources, and improving equipment and training. (Kirby & Grissmer, 1993)

Wenger and Hodari (2004) explored non-cognitive factors affecting active component (AC) attrition. Using educational and survey data on active duty recruits of all services, they found recruits who enlist at age 17 have higher attrition than those who enlist at 18. In addition, those who have ever been expelled from school have higher attrition rates than those who have never been expelled. If students indicated that they had considered dropping out of school but in fact did complete and earn a High School diploma, they were more likely to attrite than those who had never considered dropping out. The study also showed that individuals who attained a certificate of completion or attendance had equivalent attrition rates as those who earned a High School diploma. This suggests those with a certificate of completion or attendance may be a good source for recruiters despite the lack of a High School diploma due to characteristics of persistence or determination. Smokers were also found to attrite more than non-smokers revealing a potential deviant behavioral pattern. (Wenger & Hodari, Predictors of Attrition: Attitudes, Behaviors, and Educational Characteristics, 2004)

Wenger and Hodari (2004) also analyzed whether Home Schooled recruits and recruits with a GED who participated in the National Guard Youth ChalleNGe Program should be classified as Tier 1 applicants. They compared the homeschooled and ChalleNGe program recruits with other High School graduate recruits treating them all as Tier-1 eligible. The results show that both the home schooled recruits and the participants of the ChalleNGe program have much higher attrition rates than the high

school diploma recruits. The ultimate recommendations from the study were to not classify home schooled or ChalleNGe program participants as Tier-1 recruits because they are far less likely than traditional high school graduates to complete an initial obligation. (Wenger & Hodari, Final Analysis of Evaluation of Homeschool and ChalleNGe Program Recruits, 2004)

Wenger (2010) recognizes that the relationship between education credentials and first-term attrition rates in the active military is well established. However, those without high school diplomas have fairly high levels of cognitive skills but continue to have higher attrition rates than those with high school diplomas. The Army Research Institute developed a non-cognitive screen to test attributes of motivation or timeliness called the Assessment of Individual Motivation (AIM). The study showed minor correlations with low scores on the AIM screening to increased attrition, but may be a helpful tool especially when selecting GED holders. (Wenger, Expanding the Recruiting Market: Noncognitive Testing, 2010)

Hattiangadi and Parcell (2006) examined the Selected Reserve Attrition of the Marine Corps and focused on incentives to minimize attrition. The study looked at both NPS and prior service (PS) Marines but found because the NPS Marines already incurred a 6-year obligation to serve, bonuses and other measures decreased attrition slightly but made more of an impact on the PS Marines. The Marine Corps invests very little resources into the Selected Reserve Incentive Program but may need to reconsider as the Army Reserve and National Guard attract more PS Marines with enticing recruiting packages. (Hattiangadi & Parcell, 2006)

Dolfini-Reed et al (2005) assessed the impact of mobilization, activation, and deployment on losses for the SelRes of all services from September 2001 through January 2005 and compared them to losses for the SelRes in 2000. The member was considered a loss if no longer serving with the SelRes within six months of being deactivated. The study examined all enlisted SelRes (non-prior and prior service), but did not take into account those members who were still activated since they did not have the opportunity to leave while activated. The results across all the SelRes services showed higher losses than the FY 2000 comparison group and higher losses for those

who were activated but not deployed compared to those who were activated and deployed. Losses also tend to increase for those who were activated for longer periods. Those who were never activated had an increase of losses over the FY 2000 cohort and have tracked somewhat closely with those who were recently deactivated but are slightly higher than those who were activated and deployed. (Dolfini-Reed, Parcell, Gregory, & Horne, 2005)

B. SUMMARY

This thesis will address much of the same characteristics in the previous studies such as gender, race, marital status, education, performance, geographical area, and unemployment to determine possible attrition factors. Because September 11, 2001 was such an impactful event to most Americans, this thesis will examine if attrition of NPS reservists with a 6X2 contract in the USMCR has changed due to 9/11. In addition, attrition will be analyzed to evaluate the impact of reservists being mobilized and deployed in great numbers to different regions throughout the world. Lastly, this thesis will explore the impact on attrition depending on the unit composition; combat arms, aviation, or support. By addressing the impact of momentous events such as 9/11 and unprecedented levels of deployment, it can be determined if such events have a positive or negative impact on attrition so leadership can have better information in order to plan for the future. If one area of the Marine Corps reserve has less attrition than another, leadership will have the ability to target certain populations to lessen the impact of attrition, thus saving time and money and increasing readiness.

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III. VARIABLE DESCRIPTION

This chapter presents a list and description of the variables used in this thesis. The data for this thesis was provided by Marine Corps Reserve Affairs Personnel Plans, Policy, and Programming (RAP); collected from the Total Force Data Warehouse (TFDW), Marine Corps Recruiting Information Support System (MCRISS), and the Bureau of Labor and Statistics. The data from the three sources was merged together by using unique, encrypted social security numbers, while maintaining sequential monthly data throughout a reservist's tenure. In this way, a perfect match of the person to a specific time could be accomplished to reference the applicable data. The unemployment rate data was merged using the same monthly sequential data and the reservist's home of record to match the time and place with the corresponding unemployment rate.

Table 2 in Section A lists the variables divided into category, variable name, variable description, and definition. The categories are divided into the Dependent variable (attrition) and Independent variables, which are subdivided into sub-categories: deployment, demographics, military demographics, and enlistment characteristics. Variable Name, Variable Description, and Definition further explain the different variables. Sections B and C give more detail on each variable for further clarification

A. LIST OF VARIABLES

Table 2. Overview of Each Variable

Category	Variable Name	Variable Description	Definition
DEPENDENT			
Attrition	<i>attrite</i>	Individual attrited from the unit	1=attrited 0=retained
INDEPENDENT			
Deployment	<i>afg_deployment</i>	Deployed to Afghanistan at least once	1=deployed 0=otherwise
	<i>afg_freq</i>	Number of times deployed to Afghanistan	Min = 0 Max = 3
	<i>afg_total</i>	Number of months deployed to Afghanistan	Min = 0 Max = 21

	<i>iraq_deployment</i>	Deployed to Iraq at least once	1=deployed 0=otherwise
	<i>iraq_freq</i>	Number of times deployed to Iraq	Min = 0 Max = 4
	<i>iraq_total</i>	Number of months deployed to Iraq	Min = 0 Max = 24
	<i>oconus_deployment</i>	Deployed OCONUS at least once	1=deployed 0=otherwise
	<i>oconus_freq</i>	Number of times deployed OCONUS	Min = 0 Max = 4
	<i>oconus_total</i>	Number of months deployed OCONUS	Min = 0 Max = 52
	<i>hfp_deployment</i>	Deployed to a hostile fire pay area at least once	1=deployed 0=otherwise
	<i>hfp_freq</i>	Number of times deployed to a hostile fire pay area	Min = 0 Max = 4
	<i>hfp_total</i>	Number of months deployed to a hostile fire pay area	Min = 0 Max = 24
	<i>mobilized</i>	Mobilized at least once	1=mobilized 0=otherwise
	<i>mob_freq</i>	Number of times mobilized	Min = 0 Max = 4
	<i>mob_total</i>	Number of months mobilized	Min = 0 Max = 53
Demographics	<i>age</i>	Age in years at enlistment	Min = 17.25 Max = 42.25
	<i>female</i>	Gender	1=female 0=male
	<i>single</i>	Single	1=single 0=otherwise
	<i>married</i>	Married	1=married 0=otherwise
	<i>divorced</i>	Divorced	1=divorced 0=otherwise
	<i>depn_1plus</i>	Service member supports at least one dependent	1=at least one dependent 0=otherwise

	<i>depn</i>	Number of dependents	Min = 0 Max = 8
	<i>white</i>	Gender is Caucasian	1=white 0=otherwise
	<i>black</i>	Gender is African American	1=black 0=otherwise
	<i>asian</i>	Gender is Asian	1=Asian 0=otherwise
	<i>other</i>	Gender is not Caucasian, African American or Asian	1=Other 0=otherwise
Military Demographics	<i>combat_arms</i>	MOS is infantry, artillery or tanks	1=combat arms 0=otherwise
	<i>aviation</i>	MOS is aviation related	1=aviation 0=otherwise
	<i>support</i>	MOS is support related	1=support 0=otherwise
	<i>pro_con</i>	Average proficiency /conduct score in service (converted)	Min = 0 Max = 10
	<i>pro_con_poor</i>	Service members pro/cons average was less than 4.0 out of 5	1=poor pro/con 0=otherwise
	<i>pft_score</i>	Physical fitness test score converted	Min=0 Max=5.0
	<i>pft1</i>	Physical fitness test score is First Class	1=1 st class pft 0=otherwise
	<i>pft2</i>	Physical fitness test score is Second Class	1=2 nd class pft 0=otherwise
	<i>pft3</i>	Physical fitness test score is Third Class	1=3 rd class pft 0=otherwise
Enlistment Characteristics	<i>dep_time</i>	Delayed entry program in days	Min=0 Max =365
	<i>afqt</i>	Armed Forces Qualification Test score	Min=21 Max=99
	<i>afqt_high_quality</i>	AFQT score ≥ 50	1=High quality 0=otherwise
	<i>afqt_low_quality</i>	AFQT score ≤ 49	1=Low quality 0=otherwise
	<i>hs_dg</i>	High School Diploma	1=HS Diploma 0=otherwise

	<i>hs_alt</i>	Alternate HS Diploma (GED etc.)	1=Alt HS dip 0=otherwise
	<i>college_degree</i>	Any college degree (AA , BA, PhD, etc)	1=college deg 0=otherwise
	<i>ne</i>	New England (CT, MA, ME, NH, RI, VT)	1=New England 0=otherwise
	<i>ma</i>	Middle Atlantic (NJ, NY, PA)	1=middle atlantic 0=otherwise
	<i>sa</i>	South Atlantic (FL, GA, SC, NC, VA, WV, DC, MD, DE)	1=south atlantic 0=otherwise
	<i>se</i>	East South Central (KY, TN, MS, AL)	1=east south central 0=otherwise
	<i>sec</i>	West South Central (OK, AR, TX, LA)	1=west south central 0=otherwise
	<i>midwe</i>	East North Central (IL, IN, MI, WI, OH)	1= east north central 0=otherwise
	<i>midww</i>	West North Central (MO, ND, NE, KS, SD, MN, IA)	1=west north central 0=otherwise
	<i>wm</i>	Mountain (AZ, NM, NV, UT, ID, CO, MT, WY)	1=mountain 0=otherwise
	<i>wp</i>	Pacific (CA, HI, OR, WA, AK)	1=pacific 0=otherwise
	<i>unemp_rate</i>	Individuals state unemployment rate	Min=2.1 Max=16.9
	<i>C94, C95,...,C11</i>	Individuals PEBD is in FY94 , FY95,..., FY11	1=C94,C95,..., C11 0=otherwise
	<i>pre_911</i>	Individuals who completed their contract before 9/11	1=Pre-9/11 0=otherwise
	<i>overlap_911</i>	Individuals who enlisted before 9/11 but their contract ended after 9/11	1=Overlap-9/11 0=otherwise
	<i>post_911</i>	Individuals enlisted after 9/11	1=Post-9/11 0=otherwise

B. DEPENDENT VARIABLE

1. Attrition

The dependent variable is *attrite* which indicates whether the reservist remained with their drilling unit (*attrite* = 0) or if they no longer are drilling with their unit (*attrite* = 1). By creating the panel data and examining the last entry it can be determined whether a member was an attrite during the first 6 years of obligated service or if they remained to fulfill their 6-year commitment.

C. INDEPENDENT VARIABLES

1. Mobilized and/or Deployed

Mobilization is a disruption in a reservist's life. Many reservists have full time jobs in the civilian sector or go to college full- or part-time. Being mobilized puts a reservist's civilian life on hold for a year or more while they are focused on honoring their Marine Corps commitment and duty. Mobilized reservists may find themselves spending some or all their time in a myriad of locations to include their home base or other Continental United States (CONUS) locations, or Outside of the Continental U.S (OCONUS) in a friendly location such as Japan, or in hostile fire pay (HFP) areas such as Iraq or Afghanistan. Because the location of a mobilization may affect an individual's perception of quality of life, the mobilization related variables examine the location and the duration of mobilizations.

a. Mobilized

Three variables are used to measure mobilization. The first variable, *mobilized*, is binary and measures whether an individual has ever been mobilized. Another variable, *mob_freq*, determines how many times an individual has been mobilized. The other variable, *mob_total*, measures how many months an individual has been mobilized during their first tour.

b. Hostile Fire Pay Deployment

Where an individual is deployed may impact their behavior. A hostile fire pay (HFP) area is determined by the Department of Defense (DoD) as an area that may

be dangerous and where individuals receive imminent danger pay (also known as combat pay). Examples of HFP areas include Iraq, Afghanistan, numerous countries throughout the Middle East, and also some seas such as the Persian Gulf and Red Sea. The variable, *hfp_deployment*, is binary measuring whether an individual has ever been deployed to a HFP area. Another variable, *hfp_freq*, measures the number of separate HFP deployments. To measure the number of months deployed in a HFP area, the variable *hfp_total* is used.

c. *Afghanistan*

A major area of combat operations where Marine Reservists are often deployed is Afghanistan. By separating Afghanistan from other deployments, it may be possible to explain if specific areas impact deployed reservists' behavior. A binary variable, *afg_deployment*, measures whether an individual has ever been to Afghanistan. Another variable, *afg_freq*, measures how many times an individual has been deployed to Afghanistan. A final variable, *afg_total*, measures how many months an individual has spent in Afghanistan.

d. *Iraq*

Another major area of combat operations where Marine Reservists were often deployed is Iraq. Like the other variables in this section, *iraq_deployment* is binary measuring whether an individual has ever been deployed to Iraq. The frequency of deployments to Iraq is defined by the *iraq_freq* variable. Lastly, the number of months of service deployed to Iraq is measured with the *iraq_total* variable.

e. *OCONUS*

Lastly, individuals were analyzed if they were deployed anywhere outside the continental United States. These variables include HFP areas as well as “friendly” areas such as Japan or Australia, to name a few. In line with the other variables in this section, *oconus_deployment* is a binary variable measuring whether an individual has ever been deployed OCONUS.

The number of OCONUS deployments is measured using the *oconus_freq* variable. Lastly, the variable *oconus_total* measures the number of months deployed OCONUS.

2. Individual Characteristic Demographics

Individual demographic characteristics are used in this analysis as predictors of attrition. This thesis will include gender, race, marital status, and number of dependents to determine if any of these factors have an impact on an individual's probability of leaving the USMCR early.

a. Gender

A binary variable *female* is included to capture the effect of gender. In previous military manpower studies, females have been found to be more likely to attrite. The current trend in the DoD is to allow females to perform in previously restricted military occupational specialties (MOS) such as combat pilots. Current discussions are being conducted on allowing females to be assigned to ground combat MOS's such as infantry. By continuing to study gender related attrition, policy makers and planners can make better decisions.

b. Race/Ethnicity

In this data set, the Total Force Data Warehouse (TFDW) raw data provided six main racial/ethnic categories: American Indian or Alaska Native, Asian, Black or African American, native Hawaiian or other Pacific Island, White, and Declined to Respond. Because the American Indian/Alaska Native and Native Hawaiian/Pacific Island categories comprised of less than one percent of the population, they were combined with the Declined to Respond to form the *other* variable. Approximately 12 percent of the reservists did not provide any race information and thus were also placed in the *other* variable. The remaining variables for race are *white*, *black*, and *asian*. Hispanics are believed to be absorbed into a mix of the White and Other categories.

c. *Age*

Age is another demographic that is commonly used as a predictor in military attrition studies. For this thesis, the variable *age* is used to represent the age of the individual on their Pay Entry Base Date (PEBD). This will show the maturity of the individual when they started their enlistment.

d. *Marital Status*

Marital status is often used in military attrition studies to determine if relational influences have any impact. The variables *single*, *married*, and *divorced* are used to indicate an individual's current relationship status.

e. *Dependents*

Dependents may include a spouse, children, care for an elderly family member or legal guardian of a relative. This thesis examines two variables related to dependents. If a reservist has at least one dependent, the variable *depn_1plus* = 1. The variable to indicate the number of dependents is *depn*. Only one of these variables should be regressed at one time to prevent co-linearity.

3. *Military Demographics*

All Marines are assigned a Military Occupational Specialty (MOS) in which they are trained to perform a specific job and duties. The Marine Corps characterizes the job specialties into three main categories: Combat Arms, Aviation, and Support. The specific category an individual belongs to may impact attrition due to organizational culture, job environment, or other factors. In addition Marines performance is best measured by their Proficiency and Conduct (pro/con) marks and their Physical Fitness Test (PFT) scores. High pro/con and PFT scores are indicative of good performance and may correlate with lower attrition due to positive reinforcement of individual success.

a. *Marine Corps Job Areas*

Marines are categorized into 1 of 3 job areas depending on their MOS. Combat Arms consists of the infantry, tanks, and artillery. Aviation comprises with any

job related to flying, maintaining or supporting airplanes. Support MOS's are all the rest which provide other crucial services to the other areas. Examples of a support MOS include, Administration, Intelligence, Supply, Logistics, etc. By categorizing the individuals into Combat Arms, Aviation, and Support, attrition differences by community can be analyzed.

b. Proficiency and Conduct Marks

Marines in the rank of Private thru Corporal (E-1–E-4) are evaluated using Proficiency and Conduct marks. The evaluations are an indication of the individual's performance and character. Scores are evaluated using a 5-point scale from 0–5. Scores from 0–3.9 are described as “Unacceptable” to “Below Average” and are considered unfavorable. Scores from 4.0–4.4 are considered “Average”. “Excellent” scores are from 4.5–4.8 and “Outstanding” scores include 4.9–5.0. The variable *pro_con_poor* identifies below-average individuals who scored less than a 4.0 on either the pro or con score indicating poor performance. The variable *pro_con* is an average of the pro/con marks transformed into a 10-point scale. For individuals who score a 4.2/4.4, the average pro/con is 4.3 so the *pro_con* score is a 3. Individuals with 4.0 or lower score a 0. Only one of these variables should be regressed at one time to prevent co-linearity.

c. Physical Fitness Test Score

The Marine Corps Physical Fitness Test (PFT) is another indicator of performance. Marines perform the PFT at least once a year and score from 0-300 points. Three events include pull-ups, crunches, and a 3-mile run each scoring a possible 100 points. The three events scores are combined to give the individual's final score. The PFT scores are also categorized into three categories. For Marines aged 17–26, a First Class PFT is between 225–300 points, a Second Class PFT is from 175–224 points, and a Third Class PFT is from 135–174. The *pft_score* variable was created using Table 3 in order to convert the PFT score to the same scale as the pro/con variable.

Table 3. PFT Conversion Chart (From MCO P1400.32D)

Physical Fitness Test Scores to Promotion Point Conversion Chart			
Male/Female Ages 17-26		Male/Female Ages 27 and above	
PT Score	Promotion Points	PT Score	Promotion Points
280-300	5.0	280-300	5.0
270-279	4.9	270-279	4.9
260-269	4.8	260-269	4.8
250-259	4.7	250-259	4.7
240-249	4.6	240-249	4.6
225-239	4.5	225-239	4.5
215-224	4.4	215-224	4.4
205-214	4.3	205-214	4.3
195-204	4.2	200-204	4.2
185-194	4.1	195-199	4.1
175-184	4.0	185-194	4.0
170-174	3.9	175-184	3.9
160-169	3.8	170-174	3.8
150-159	3.7	160-169	3.7
140-149	3.6	150-159	3.6
135-139	3.5	140-149	3.5
0-134	0	135-139	3.4
		110-134	3.0
		0-109	0

4. Enlistment Characteristics

Enlistment Characteristics consist of the reservist's demographics when they were enlisted in the reserves. In this thesis, the following characteristics will be examined: Armed Forces Qualification Test (AFQT) score, the home area of the reservist and its corresponding unemployment rate, the highest level of education, and the year the reservist joined the USMCR. These variables can all predict attrition behavior.

a. Armed Forces Qualification Test (AFQT)

The Armed Forces Qualification Test (AFQT) score is a standardized test given to every military enlistee to test for aptitude and ability. The scores range from 0–99. In addition to the raw score, the AFQT was divided into two categories, “high performers” (scored ≥ 50) and “low performers” (scored ≤ 49) in order to demonstrate any differences in the attrition of these groups. Only one of these variables should be regressed at one time to prevent co-linearity.

b. Education

An individual's education level is another important variable to examine in attrition models. Individuals with a high school diploma (HSD) have traditionally

been more successful than those without a HSD. This thesis has created three variables: High School Diploma, Alternate High School Diploma, and College Degree to define education level of the reservists. In other studies involving attrition, those with an alternative to the traditional HSD tend to attrite at a higher rate than others who have completed high school.

c. Geographic Area

Most 6X2 NPS reservists enlist and join a unit close their hometowns. Different geographic regions throughout the U.S. may display different attrition behaviors. This thesis divided the U.S. into 9 geographic regions to be in line with the U.S. census designations. The regions include: New England, Middle Atlantic, South Atlantic, East South Central, West South Central, East North Central, West North Central, Mountain, and Pacific. Figure 4 shows which states belong to each region.



Figure 4. Census Regions and Division in the United States (From Census Bureau's Geographic Areas Reference Manual, 1994)

d. Unemployment Rate

The unemployment rate may also be a factor that affects the attrition behavior of an individual. Because every state has a different unemployment rate at different times throughout the period, data from the Bureau of Labor Statistics was collected to match each individual with the corresponding unemployment rate. The data was collected to show the monthly unemployment rate for every state from FY 1994 through 2011.

e. Cohort

The population was divided into cohorts based on the fiscal year of the individual's (PEBD). Nineteen different cohorts from FY 1994 thru FY 2011 were

created. It is possible that major events such as September, 11 2001 or periods of high mobilization and deployments may have affected individuals' attrition behavior.

f. September 11, 2001– Pre, Overlap, and Post Contracts

The terrorist attacks on the American homeland on September 11, 2001 (9/11) changed the way Americans viewed their security. A brand new cabinet department of the federal government, The Department of Homeland Security was created in response to the attacks on 9/11 to protect the U.S. from further attacks and provide support in case of an attack, a man-made accident or a natural disaster. The way Americans felt about protecting the homeland was very different after 9/11 than before. In this thesis, three variables were created to delineate the population of reservists who completed their 6X2 contract prior to the 9/11 attacks, those whose contract overlapped 9/11, and those who enlisted after 9/11. By comparing the three variables, we can assess the impact of 9/11 on individuals behavior related to attrition.

D. SUMMARY

This chapter provided a list and the description of the variables in this thesis. The dependent variable is *attrite*, which measures whether an individual has retained, *attrite* = 0, or is no longer with the unit, *attrite* = 1. The independent variables to examine retention/attrition characteristics include deployment and mobilization characteristics including where individuals were mobilized, how many times, and for how long. Personal demographics such as age, gender, marital status, characteristics related to dependents/children, and race is also included. In addition, military demographics including the type of Marine Corps job (combat arms, aviation, or support), and individual performance characteristics determined by pro/con marks and PFT scores are used to explain attrition. Lastly, the enlistment characteristics of the individuals are used.

They include reservists AFQT scores, their highest level of education (GED, HSD, college, etc.), the area of the country the individual is from and its corresponding unemployment rate, the FY cohort the individual belongs to calculated by his/her PEBD, and the individuals enlistment contract in relation to 9/11 (Pre, Overlap, or Post). By examining these factors, we will have a better understanding of the characteristics of those who are more likely to attrite.

IV DESCRIPTIVE STATISTICS AND PRELIMINARY DATA ANALYSIS

The purpose of this chapter is to present descriptive statistics and preliminary analysis of the NPS reservist data for the years FY 1994 through FY 2011. The data is discussed for the entire sample and for three sub-samples covering three time periods: Pre-9/11, Overlap-9/11, and Post-9/11. Because September 11, 2001 was such a monumental event, the samples differ depending on when the individual served relative to 9/11. The Pre-9/11 sample consists of reservists who enlisted in FY 1994 and FY 1995, and whose initial six-year obligation expired prior to the events of September 11, 2001 (namely in the years 2000–2001). The Overlap-9/11 sample consists of reservists who enlisted between FY 1996 and 2001. These individuals all enlisted prior to 9/11 but their 6-year service obligation did not expire until after 9/11 (namely in the period 2002–2007). The Post-9/11 sample contains individuals who enlisted between FY 2002 and 2005 after 9/11 but who completed their six-year obligation prior to September 30, 2011, the last period for which data is available. Thus, these reservists completed their obligations during the period from 2008 to 2011.

The data was collected as panel data with over 3.5 million observations consisting of multiple monthly observations for the same individual. This would allow for up to 72 observations for an individual who served the entire six-year commitment. Because we are not interested in 72 observations on the same individual, the data is analyzed using only the last observation of each individual. By using only one observation for each individual, a more accurate picture of the demographics of the population can be represented. For example, if females consistently complete their six-year obligation, each female reservist would have 72 observations per person. Likewise, if males attrite early in their contract, there would be considerably fewer observations per male collectively and thus give an inaccurate portrayal of the demographics of the sample indicating a higher retention rate for females.

The data is analyzed using two models. The first model uses restricted data which includes only those reservists who actually deployed OCONUS at least once. Individuals

who deployed OCONUS are very similar to each other whether they attrited or completed their six-year obligation because they had similar experiences and remained with the reserves for a significant period (at least long enough for one deployment). Individuals who did not deploy OCONUS or attrited early in their reserve commitment are inherently different from those who remain. By limiting the sample to only those who deployed OCONUS, we minimize bias and get a more accurate picture of the effect of deployment on attrition. The drawback to restricting the model to only those who deployed OCONUS is, we lose information on the Pre-9/11 cohort because only 0.3 percent deployed OCONUS and cannot be accurately analyzed. Because of this, we analyze a second model of the entire unrestricted sample to observe characteristics of the Pre-9/11 cohort in order to compare with those who served after 9/11.

A. DESCRIPTIVE STATISTICS FOR THE FULL SAMPLE AND THREE SUB-SAMPLES WHO DEPLOYED OCONUS (FY 1994–2005)

The data in column 1 of Table 4 represents NPS 6X2 contract reservists who deployed at least once OCONUS. These reservists enlisted during FY 1994–2005 and thus had the opportunity to complete their 6-year enlistment before the last observation in the data set, October 31, 2011. There is insufficient time to observe a full six-year contract period for individuals who enlisted in FY 2006–2011. By removing those who enlisted in FY 2006–2011, bias is eliminated because those individuals would have only been observed for five years or less.

Columns 1–4 of Table 4 show the four analysis samples of reservists who deployed OCONUS: (1) The full sample for FY 1994–2005; (2) The Pre-9/11 group that enlisted in FY 1994 and 1995 and completed their 6-year commitment prior to 9/11; (3) The Overlap-9/11 group that enlisted prior to 9/11 during FY 1996–2001 but whose six-year contracts expired sometime after 9/11; and (4) The Post-9/11 group that enlisted after 9/11 during FY 2002–2005.

Table 4. Descriptive Statistics for the Full Sample and Three Sub-Samples (FY 1994–2005) of reservists who deployed OCONUS

Variable	(1) Full Analysis Sample 1994-2005	(2) Pre-9/11 Sample 1994-1995	(3) Overlap-9/11 Sample 1996-2001	(4) Post-9/11 Sample 2002-2005
attrite	.117 (.3214)	.3103 (.4708)	.0787 (.2693)	.1429 (.3499)
gender (female = 1)	.023 (.1499)	0 (0)	.0208 (.1427)	.0246 (.1549)
age at enlistment	19.9227 (2.284)	20.0882 (2.425)	19.8526 (2.2821)	19.9705 (2.2839)
Single (=1)	.6819 (.4657)	.6552 (.4837)	.6785 (.4671)	.6844 (.4648)
Married (=1)	.2981 (.4574)	.2759 (.4549)	.3043 (.4601)	.2939 (.4556)
Divorce (=1)	.0199 (.1398)	.069 (.2579)	.0172 (.1299)	.0217 (.1458)
at least one dependent (=1)	.3358 (.4723)	.3448 (.4837)	.3498 (.4769)	.3261 (.4688)
# of dependents	.5502 (.9355)	.931 (1.6676)	.5725 (.9511)	.534 (.922)
White = 1	.7534 (.431)	.7241 (.4549)	.7381 (.4397)	.7641 (.4246)
African American =1	.0719 (.2583)	.069 (.2579)	.0897 (.2857)	.0597 (.2369)
Asian = 1	.0385 (.1923)	.069 (.2579)	.0401 (.1962)	.0373 (.1894)
Pacific Is, Am Indian or no response	.1362 (.343)	.1379 (.3509)	.1321 (.3387)	.139 (.3459)
1994 Cohort	.0006 (.0254)	.4828 (.5085)		
1995 Cohort	.0007 (.0263)	.5172 (.5085)		
1996 Cohort	.0009 (.0303)		.0023 (.0475)	
1997 Cohort	.0052 (.0716)		.0126 (.1118)	
1998 Cohort	.0549 (.2279)		.1349 (.3416)	
1999 Cohort	.0794 (.2703)		.1948 (.3961)	
2000 Cohort	.1246 (.3303)		.3059 (.4608)	
2001 Cohort	.1424 (.3495)		.3496 (.4769)	
2002 Cohort	.1539 (.3608)			.2602 (.4388)
2003 Cohort	.1471 (.3542)			.2488 (.4324)
2004 Cohort	.1522 (.3593)			.2575 (.4373)
2005 Cohort	.1381 (.345)			.2335 (.4231)
expectation not to deploy (Pre-9/11)	.0013 (.0365)	1 (0)	0 (0)	0 (0)
expectation changed due to 9/11 (overlap)	.4074 (.4914)	0 (0)	1 (0)	0 (0)
expectation to deploy (Post-9/11)	.5913 (.4916)	0 (0)	0 (0)	1 (0)
Combat arms MOS	.3749	.3448	.3742	.3754

Variable	(1) Full Analysis Sample 1994-2005	(2) Pre-9/11 Sample 1994-1995	(3) Overlap-9/11 Sample 1996-2001	(4) Post-9/11 Sample 2002-2005
	(.4841)	(.4837)	(.4839)	(.4843)
Aviation MOS	.0496	.069	.0542	.0465
	(.2172)	(.2579)	(.2264)	(.2105)
Support MOS	.5755	.5862	.5716	.5781
	(.4943)	(.5012)	(.4949)	(.4939)
AFQT Score	66.9309	72.9259	66.9008	66.9389
	(18.7899)	(17.389)	(18.7191)	(18.8408)
Low quality AFQT (Score 21 to 49)	.2074	.0741	.2055	.2089
	(.4054)	(.2669)	(.4041)	(.4066)
High quality AFQT (score >=50)	.7926	.9259	.7945	.7911
	(.4054)	(.2669)	(.4041)	(.4066)
Aggregate Pro/Cons using a 10.0 scale	4.3329	4.931	4.5197	4.2028
	(1.3406)	(1.9073)	(1.4069)	(1.2752)
PFT score	44.6658	44.6818	44.2001	45.0202
	(3.75)	(3.1681)	(3.8957)	(3.5965)
1 st Class PFT	.5614	.6207	.4887	.6113
	(.4962)	(.4938)	(.4999)	(.4875)
2 nd Class PFT	.2903	.2414	.3305	.2627
	(.4539)	(.4355)	(.4704)	(.4401)
3 rd Class PFT	.0667	.0345	.0925	.049
	(.2495)	(.1857)	(.2897)	(.2159)
Other PFT	.0806	.1034	.087	.0762
	(.2722)	(.3099)	(.2818)	(.2653)
High School Diploma	.906	.8148	.9121	.9014
	(.2919)	(.3958)	(.2832)	(.2982)
Alt HS Diploma (GED, homeschool)	.037	.0741	.029	.0433
	(.1888)	(.2669)	(.1679)	(.2034)
Any college degree	.0569	.1111	.0589	.0552
	(.2316)	(.3203)	(.2354)	(.2284)
education code missing	.0805	.069	.0044	.1329
	(.272)	(.2579)	(.0662)	(.3395)
State unemployment rate	6.4586	4.4577	5.1424	7.3705
	(2.4055)	(.9675)	(1.0545)	(2.6431)
IL, IN, MI, WI, OH	.154	0	.1503	.1569
	(.361)	(0)	(.3574)	(.3637)
MO, ND, NE, KS, SD, MN, IA	.0447	.0385	.0343	.0518
	(.2066)	(.1961)	(.182)	(.2217)
CT, MA, ME, NH, RI, VT	.061	0	.0527	.0669
	(.2394)	(0)	(.2235)	(.2498)
NJ, NY, PA	.1481	.1538	.1594	.1403
	(.3552)	(.3679)	(.366)	(.3474)
FL, GA, SC, NC, VA, WV, DC, MD, DE	.1781	.3077	.1808	.1759
	(.3826)	(.4707)	(.3848)	(.3808)
KY, TN, MS, AL	.0675	.0385	.0694	.0663
	(.251)	(.1961)	(.2541)	(.2489)
OK, AR, TX, LA	.1274	.1538	.1296	.1259
	(.3335)	(.3679)	(.3359)	(.3317)
AZ, NM, NV, UT, ID, CO, MT, WY	.0569	.1154	.0646	.0514
	(.2316)	(.3258)	(.2459)	(.2209)
CA, HI, OR, WA, AK	.1622	.1923	.1589	.1645
	(.3687)	(.4019)	(.3656)	(.3707)
Mobilized at Least Once	.9959	.3448	.9947	.9982

Variable	(1) Full Analysis Sample 1994-2005	(2) Pre-9/11 Sample 1994-1995	(3) Overlap-9/11 Sample 1996-2001	(4) Post-9/11 Sample 2002-2005
	(.0639)	(.4837)	(.0727)	(.0423)
Number of separate mobilizations	1.2421	.3793	1.2098	1.2663
	(.4614)	(.5615)	(.4328)	(.4768)
Total months previously mobilized	13.0068	3.8966	11.584	14.0075
	(6.0118)	(6.1606)	(5.893)	(5.8766)
Deployed OCONUS at Least Once	1	1	1	1
	(0)	(0)	(0)	(0)
Number of separate OCONUS deploys	1.1911	1.069	1.1493	1.2201
	(.4181)	(.2579)	(.3759)	(.4428)
Total months previously OCONUS	7.2676	8.5517	6.5915	7.7305
	(5.4515)	(5.7915)	(5.6781)	(5.2389)
Deployed to a HFP zone at least once	.9726	.3793	.9471	.9914
	(.1633)	(.4938)	(.2238)	(.0921)
Number of separate HFP deployments	1.1454	.4138	1.0696	1.1993
	(.4414)	(.568)	(.4221)	(.445)
Total months in HFP zone	6.2677	2.6552	5.1249	7.0632
	(3.1142)	(3.7443)	(2.9626)	(2.9602)
Deployed Iraq at Least Once	.6522	.2414	.3967	.8292
	(.4763)	(.4355)	(.4892)	(.3763)
Number of separate Iraq deployments	.7327	.2414	.4118	.9549
	(.602)	(.4355)	(.5225)	(.551)
Total months previously Iraq	4.4062	1.6207	2.4052	5.7909
	(3.8014)	(2.9449)	(3.2429)	(3.533)
Deployed AFG at Least Once	.0334	0	.016	.0454
	(.1797)	(0)	(.1256)	(.2083)
Number of separate AFG deployments	.0349	0	.0171	.0472
	(.1913)	(0)	(.1371)	(.2204)
Total months previously AFG	.1804	0	.1073	.2312
	(1.0916)	(0)	(.9267)	(1.1905)
Observations	21735	29	8854	12852
Standard deviations in parentheses				

1. Descriptive Statistics for the Full 1994–2005 Sample

Column 1 of Table 4 provides descriptive statistics for the sample of NPS 6X2 USMCR enlistees for 1994–2005 who deployed at least once OCONUS. The panel data was compressed to obtain 21,735 individuals who are observed on their last date in the USMCR. A total attrition rate of 11.7 percent was observed for all individuals. Women comprise 2.3 percent of the sample and African Americans are 7.2 percent. The majority (57.6 percent) of the sample had a support MOS, while 37.5 percent had a Combat Arms MOS. For the full sample overall, 65.2 percent of the reservists were deployed at least

once to Iraq, 3.3 percent were deployed at least once to Afghanistan, and 97.3 percent were deployed at least once to a hostile fire pay (HFP) area.

2. Descriptive Statistics for the Pre-9/11 Sample (1994–1995 Cohorts)

Column 2 of Table 4 represents the population of NPS reservists with a 6X2 contract who enlisted in FY 1994 or 1995 and deployed OCONUS at least once. This group is unique from the other cohorts because they had the opportunity to complete their 6-year commitment prior to the events of 9/11. The sample contains only 29 individuals because very few reservists were mobilized or deployed prior to 9/11. Support MOS marines comprised 57.6 percent of the sample and Combat Arms MOS marines represented 34.5 percent. Interestingly, 92.6 percent of this group had a high quality AFQT score (≥ 50) and the average PRO/CON score was a 4.9 indicating although a small number, predominantly only those with proven ability were deployed OCONUS during this period. This is contrasting to the average for the entire period (1994–2005) of 79.3 percent for High Quality AFQT and 4.3 for Pro/Con scores. Because the sample is so small (29 observations) an accurate analysis of this group compared to the other cohorts cannot be accomplished. It is likely that the individuals in this cohort were chosen for an OCONUS deployment because they were top performers and thus were selected to attend a special exercise/operation overseas.

3. Descriptive Statistics for the Overlap-9/11 Sample (1996–2001 Cohorts)

Column 3 of Table 4 represents the descriptive statistics of the Overlap-9/11 sample. During this period, 8,854 NPS reservists with a 6X2 contract deployed OCONUS at least once. This cohort enlisted between FY 1996 and 2001. All of their contracts terminated at some time after September 11, 2001. This population is very similar to the Pre-9/11 population in that there was no expectation of mobilization or deployment when these individuals enlisted. However, the events of 9/11 may have altered this population's behavior with respect to attrition.

The average attrition rate for the Overlap-9/11 population is 7.9 percent. Females comprise of 2.5 percent of the sample and 9.0 percent is African American. Support

MOS make up 57.2 percent of the sample and Combat Arms MOS comprises 37.4 percent. This group saw a large proportion (94.7 percent) deploying at least once to a HFP area, but most did not make it into Iraq or Afghanistan. Only 39.7 deployed at least once to Iraq, and 1.6 percent to Afghanistan. This would indicate that many probably spent their deployments in one of the Persian Gulf countries (Kuwait, Bahrain, Qatar, etc.) which helped support Operations Iraqi and Enduring Freedom.

4. Descriptive Statistics for the Post-9/11 Sample (2002–2005 Cohorts)

Column 4 of Table 4 presents descriptive statistics for the Post-9/11 sample whose members deployed at least once OCONUS. The Post-9/11 population is unique in the fact that these NPS individuals enlisted in the USMCR with a 6X2 contract after 9/11 occurred and President Bush had declared a war on terrorism. Combat operations began in Afghanistan in October of 2001 and in Iraq in March of 2003. It is likely people who enlisted at this time would have had an expectation of being mobilized and deployed to help support the Global War on Terrorism. This sample consists of 12,852 reservists who enlisted between FY 2002 and 2005 and deployed at least once OCONUS. Reservists enlisting after FY 2005 were not included in this study because a full 6-year observation period could not be observed. The average attrition rate for the Post-9/11 cohort was 14.3 percent. Females comprised 2.5 percent of the sample and African Americans made up 6.0 percent. The ratio of Support to Combat Arms MOS remained consistent with the Overlap-9/11 cohort with 57.9 percent assigned a Support MOS and 37.5 percent a Combat Arms MOS. Almost this entire group (99.1 percent) was deployed to a HFP area. Iraq was the most popular destination with 82.9 percent of this group operating in Iraq. Although higher than the Overlap-9/11 group, only 4.7 percent of this group deployed to Afghanistan at least once.

B. DESCRIPTIVE STATISTICS FOR THE FULL SAMPLE AND THREE SUB-SAMPLES UNRESTRICTED MODEL (FY 1994–2005)

The previous section restricted the sample to only those who deployed OCONUS at least once. Because reservists in the Pre-9/11 cohort rarely deployed, they cannot be accurately analyzed due to the limited observations available.

Because of this, the entire (unrestricted) sample is analyzed in this section to understand the characteristics between the cohorts.

1. Attrition by Cohort

Table 5 presents the average attrition rate for the entire population, regardless of deployment or not, for each entry cohort during FY 1994–2005. As depicted, the average attrition rate of those who were in the Pre-9/11 cohort (1994–1995) was 36.1 percent, whereas the Overlap-9/11 (1996–2001) average attrition rate was 32.8 percent and the Post-9/11 (2002–2005) average attrition rate was 30.1 percent.

Table 5. Average Attrition Rates by Cohort (1994–2005)

Cohort	Obs	Mean	Std. Dev.
1994	4,933	.357	.479
1995	4,763	.366	.482
1996	5,038	.383	.486
1997	5,388	.362	.481
1998	5,193	.316	.465
1999	5,099	.309	.462
2000	5,448	.300	.458
2001	5,253	.298	.458
2002	5,090	.298	.458
2003	5,134	.305	.460
2004	5,317	.305	.460
2005	5,106	.297	.457
Pre-9/11	9,696	.361	.480
Overlap-9/11	31,419	.328	.469
Post-9/11	20,647	.301	.459

Figure 5 best illustrates the average attrition for the mid-1990s cohorts near 36 percent followed by a declining trend for later cohorts towards 30 percent.

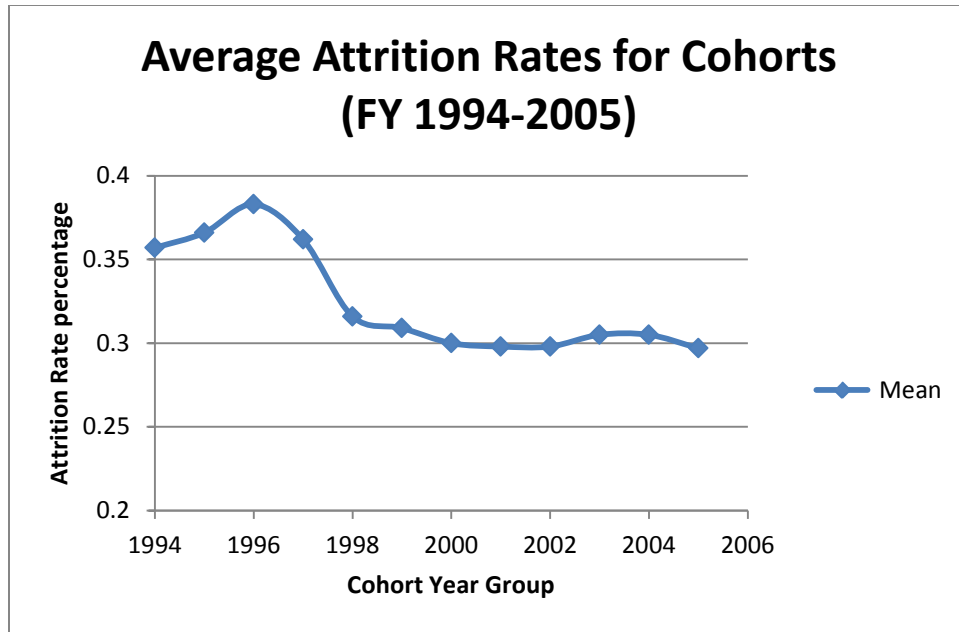


Figure 5. Average Attrition Rates for Cohorts (FY 1994–2005)

2. Deployments by Cohort

The likelihood of deploying for a reservist during this period really depended on when the reservist enlisted. The Pre-9/11 cohort was very unlikely to deploy (0.3 percent) whereas the Post-9/11 cohort had at least a 60 percent chance of deployment. Table 6 illustrates the percentage of reservists who deployed either to Afghanistan, Iraq, OCONUS, HFP area, or were mobilized. When comparing deployment between Iraq and Afghanistan, the preponderance of reservists deployed to these countries went to Iraq. Only 2.8 percent of the Post-9/11 cohort deployed to Afghanistan, whereas 51.6 percent of them deployed to Iraq.

Table 6. Average Percentage Deployed to Each Area by Cohort

Variable	Total period (94-05)	Pre 9/11 (94-95)	Overlap 9/11 (96-01)	Post 9/11 (02-05)
Deployed to Afg	.0118	0	.0045	.0283
Deployed to Iraq	.2295	.0007	.1118	.5162
Deployed OCONUS	.3519	.0030	.2818	.6225
Deployed to HFP area	.3423	.0011	.2669	.6171
Mobilized	.4191	.0011	.3733	.6850
Observations	61762	9696	31419	20647

C. UNEMPLOYMENT BY COHORT

Table 7 shows the average unemployment rate for each respective cohort from FY 1994 to 2005. The unemployment rates are derived from the home state of the individuals at the date when the individual was either an attrite or completed their 6-year commitment. America experienced relatively comfortable unemployment rates prior to September 11, 2001 with an average unemployment in this sample of 4.5 percent. After the events of 9/11, America's unemployment rate increased. The Post-9/11 sample experienced an average unemployment rate of 7.0 percent. The hardest hit states were Puerto Rico, Nevada, Michigan, and California, which all had periods of unemployment greater than 12 percent. The states with the lowest unemployment rates included Connecticut, Nebraska, Virginia, and Hawaii which enjoyed rates lower than 2.5 percent during the periods covered by this study.

Table 7. Average Unemployment rates by Cohort (1994–2005)

Cohort	Obs	Mean	Std. Dev.	Min	Max
1994	4,900	4.625	1.146	2.2	15.1
1995	4,710	4.405	1.039	2.1	13.6
1996	5,024	4.883	1.093	2.2	13.2
1997	5,364	5.289	1.210	2.1	13.2
1998	5,177	5.452	1.238	2.2	13.3
1999	5,077	5.313	1.070	2.1	12.6
2000	5,440	5.188	1.102	2.1	12.5
2001	5,237	4.886	.996	2.3	12.1
2002	5,084	4.951	.984	2.4	11.6
2003	5,128	6.175	1.660	2.7	13.9
2004	5,304	8.297	2.671	2.4	15.9
2005	5,074	8.483	2.582	2.5	14.9
Pre-9/11	9,610	4.517	1.100	2.1	15.1
Overlap-9/11	31,319	5.170	1.142	2.1	13.3
Post-9/11	20,590	6.988	2.567	2.4	15.9
1994– 2005	61,519	5.676	1.993	2.1	15.9

D. SUMMARY

This chapter discussed descriptive statistics for the various samples of reservists. Three sub-samples were created to look at the characteristics of those in the sample: Pre-9/11, Overlap-9/11, and Post-9/11. Two different groups of reservists were compiled. The first group consists of only those reservists who deployed OCONUS at least once. This will enable a comparison of individuals who are very similar in experiences and limit bias. Unfortunately, the Pre-9/11 cohort has limited observations (only 29), and will not be able to be accurately analyzed with the Overlap-9/11 and Post-9/11 cohorts. The second group of reservists uses the unrestricted sample of all NPS reservists who enlisted with a 6X2 contract from 1994– 2005. This will allow comparisons of the Pre-9/11 cohort with the other cohorts but will restrict accurate analysis on the effects of deployments on attrition due to the fact that so few of the Pre-9/11 reservists deployed. From the statistics, it is apparent that attrition rates decreased from the mid-1990's to the years after 9/11. Mobilization and Deployment rates increased over the same period. Unemployment rates also changed significantly, increasing from the Pre-9/11 to Post-9/11 period. Most of the demographic variables remained fairly constant throughout the period and were consistent throughout the individual cohorts.

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V. MULTIVARIATE DATA ANALYSIS

This thesis evaluates the effects of multiple factors on attrition behavior of enlisted reservists. Because attrition is a binary dependent variable, a probit model is used to calculate the effect of each specific factor on the probability of attrition. The following equation is an example of a probit model:

$$P(y = 1 | X) = \Phi(a + b X)$$

y is the dependent variable, attrition

Φ is the cumulative distribution function of the standard normal random variable

X are the independent variables (deployments, demographics, performance)

By using a probit model, specific characteristics can be isolated to estimate the change in the probability of attrition due to a one-unit change in the specific factor holding all the other variables constant.

In order to compare those who attrite with those who remain with their reserve unit for the duration of their six-year contract, this thesis uses two models. The first model restricts the sample to analyze the NPS reservists who enlisted from 1996 to 2005 with a 6X2 contract and who have deployed OCONUS at least once. By comparing only those reservists who actually deployed, a more accurate analysis can be conducted to determine the effects of the type of deployment on attrition. Bias is minimized by removing reservists who never deployed. Individuals who attrited prior to an OCONUS deployment are very different than those who participated in an OCONUS deployment because they lack the experiences of a deployment and duration of being part of a reserve unit. Regression models are estimated for three different samples of reservists: (1) The entire population of non-prior service (NPS) USMCR with a 6X2 contract who enlisted from FY 1996 through 2005 and who had at least one OCONUS deployment; (2) the Overlap-9/11 cohort, with at least one OCONUS deployment, which enlisted from FY 1996 to 2001 prior to 9/11 but whose six-year contract expired after 9/11; and (3) the Post-9/11 cohort, with at least one OCONUS deployment, which enlisted after 9/11 from FY 2002 through 2005 and whose six-year contract expired prior to 31 October 2011.

The probit models analyze the effect of independent variables for deployment characteristics, demographics, performance characteristics, education, and geographic areas.

Because the first model only includes the Overlap-9/11 and Post-9/11 reservists, another model (unrestricted) is used to measure the effects of variables other than deployment on attrition for all three cohorts, Pre-9/11, Overlap-9/11, and Post-9/11. The unrestricted model is also a probit model and will be used to differentiate demographics, performance, education, and regional characteristics between the three cohorts.

A. HYPOTHESIZED EFFECTS OF THE VARIABLES ON ATTRITION

It is assumed that all of the independent variables will have some impact on the likelihood of whether a reservist will attrite or remain to fulfill their 6-year contract. Table 8 is a list of the hypothesized attrition effects of each variable. The Pre-9/11 cohort is used as the base group to compare with the Overlap-9/11 and Post-9/11 cohorts. Comparisons will be used to evaluate the effects of 9/11, mobilizations and deployments, and other personal characteristics. The hypothesized results are depicted with a (+) if the variable is hypothesized to increase attrition and a (-) if the variable is hypothesized to decrease attrition. These hypotheses are based on previous studies included in the Literature Review in Chapter II.

Table 8. Hypothesized Effects of Independent Variables on Attrition

Category	Explanatory Variable	Pre 9/11	Overlap 9/11	Post 9/11
Deployment	Deployed to a HFP area at least once	N/A	+	-
	Deployed to Afghanistan at least once	N/A	+	-
	Deployed to Iraq at least once	N/A	+	-
Demographics	Female	+	+	+
	Age	+	+	+
	At least one dependent	+	+	+
	Married	+	+	+
	Divorced	-	-	-
	African American	-	-	-
	Asian	-	-	-
	Other	-	-	-
Unit Type	Aviation	-	-	-
	Support	-	-	-
Performance	High Quality AFQT	-	-	-
	Proficiency/Conduct score	-	-	-
	College Degree	-	-	-
	Alt High School Degree (GED)	+	+	+
Geographic area	Midwest (WI, MI, IL, IN, OH)	+	+	+
	West Midwest (ND, SD, NE, KS, MN, IA, MO)	+	+	+
	Mid Atlantic (NY, PA, NJ)	+	+	+
	South Atlantic (MD, DE, DC, WV, VA, NC, SC, GA, FL)	+	+	+
	Southeast (KY, TN, MS, AL)	+	+	+
	SE Central (OK, TX, AR, LA)	+	+	+
	Mountain (MT, ID, WY, NV, UT, CO, AZ, NM)	+	+	+
	Pacific (CA, OR, WA, AK, HI)	+	+	+

1. Hypothesized Relationships

There is no hypothesized relationship between deployment and attrition for the Pre-9/11 cohort due to the fact that very few reservists during this period were ever mobilized or deployed. There are a few reservists who may have deployed OCONUS either for Annual Training or other events and most likely enjoyed the experience of travel, which would possibly reduce attrition. The Overlap-9/11 Cohort is expected to attrite at higher rates after deployments because they had no expectation of mobilization or deployment when they enlisted prior to 9/11. The drastic change in one's life due to a deployment is likely to increase attrition. We hypothesize that the Post-9/11 cohort would have lower attrition due to deployments because they had an expectation of deployment when they enlisted knowing the country was at war.

The demographic characteristics of individuals also may affect attrition. Based on previous studies (see literature review in Chapter II), women and reservists with dependents have a tendency to have higher attrition. Older individuals at enlistment are also more likely to attrite than those who are at the average age. Minorities have been found to have lower attrition than Caucasians in previous studies and divorced reservists may have lower attrition due to a need for relational belonging to the Marine Corps organization.

Unit type and culture can also affect attrition. The aviation and support MOS's have a reputation of experiencing a better quality of life than the combat arms MOS's and thus would expect lower attrition. Performance is also a predictor of attrition. Attrition is expected to be lower for those who get higher scores, have higher aptitude, and outperform others.

Geographic areas of the country can also predict attrition. In this thesis the Northeast is the base group to which the other areas are compared. Because the Northeast has a reputation of being one of the most educated areas of the country, all the other areas are predicted to have higher attrition than the Northeast.

B. PROBIT REGRESSION MODEL USING COHORTS FY (1996–2005) – SAMPLE RESTRICTED TO THOSE WITH OCONUS DEPLOYMENTS

The full cohort consists of the combined samples of USMCR NPS enlistees with a 6X2 contract who enlisted between FY 1996 and 2005 and who deployed OCONUS at least once. The sample size is 19,564. The Pre-9/11 sub-group is omitted from the analysis since the sample size of OCONUS deployers was only 29. In addition to the independent variables used in all the models, two cohort variables are used in order to evaluate differences in attrition: Overlap-9/11 enlisted in FY 1996–2001, and Post-9/11 enlisted in FY 2002–2005. The probit model to estimate the determinants of attrition for the two sub-groups is specified as follows:

$$P(\text{attrite} = 1|X) = F(\beta_0 + \beta_1(\text{Post-9/11}) + \beta_2(\text{Deployment Variables}) + \beta_3(\text{Demographics}) + \beta_4(\text{Aptitude}) + \beta_5(\text{Regions}))$$

Because *attrite* is a binary variable, marginal effects are used to describe the changes in the probability of attrition associated with a 1-unit change in each independent variable. It is important to note that when analyzing the effect of an independent variable on attrition, all the other independent variables are held constant at their mean value. Table 9 reports the estimated probit coefficients and the marginal effects for the full sample (1996–2005) of NPS reservists with a 6X2 contract who deployed at least once OCONUS.

Table 9. Probit Attrition Model, Full Sample (1996–2005) Restricted to Reservists with at Least One OCONUS Deployment

VARIABLES	(1) Probit Results	(2) Marginal Effects
Post 9/11 Cohort (FY 02 – 05)	0.570*** (0.0294)	0.100*** (0.00494)
Deployed to AFG at least once	-0.466*** (0.0970)	-0.0633*** (0.00922)
Deployed to Iraq at least once	-0.375*** (0.0298)	-0.0729*** (0.00612)
Deployed to HFP area at least once	-0.221*** (0.0717)	-0.0456*** (0.0166)
Age at enlistment	0.0198*** (0.00565)	0.00361*** (0.00103)
Gender (Female=1)	0.292*** (0.0747)	0.0629*** (0.0186)
At least one Dependent	-0.350***	-0.0596***

VARIABLES	(1) Probit Results	(2) Marginal Effects
	(0.0634)	(0.0100)
Married	0.210***	0.0403***
	(0.0653)	(0.0132)
Divorced	-0.119	-0.0201
	(0.0943)	(0.0148)
African American	0.0251	0.00463
	(0.0463)	(0.00866)
Asian	-0.0809	-0.0141
	(0.0673)	(0.0111)
Race is "Other"	-0.143***	-0.0244***
	(0.0380)	(0.00605)
Aviation MOS	0.201***	0.0408***
	(0.0585)	(0.0131)
Support MOS	-0.0126	-0.00230
	(0.0263)	(0.00480)
AFQT score ≥ 50	-0.142***	-0.0272***
	(0.0293)	(0.00591)
PRO/CON scores	-0.179***	-0.0326***
	(0.00854)	(0.00155)
Non HS Diploma	0.159***	0.0317**
	(0.0590)	(0.0128)
College Degree (AA, BA, MA, PhD)	-0.113*	-0.0193**
	(0.0602)	(0.00962)
Midwest (WI, MI, IL, IN, OH)	0.00562	0.00103
	(0.0584)	(0.0107)
West Midwest (ND, SD, NE, KS, MN, IA, MO)	0.151**	0.0299*
	(0.0747)	(0.0160)
Mid Atlantic (NY, PA, NJ)	-0.0698	-0.0123
	(0.0590)	(0.0101)
South Atlantic (MD, DE, DC, WV, VA, NC, SC, GA, FL)	0.0998*	0.0189*
	(0.0572)	(0.0113)
Southeast (KY, TN, MS, AL)	0.177***	0.0353**
	(0.0667)	(0.0145)
SE Central (OK, TX, AR, LA)	0.0761	0.0144
	(0.0588)	(0.0115)
Mountain (MT, ID, WY, NV, UT, CO, AZ, NM)	0.0393	0.00732
	(0.0703)	(0.0134)
Pacific (CA, OR, WA, AK, HI)	-0.106*	-0.0184*
	(0.0598)	(0.00994)
Observations	19,564	19,564
Log Likelihood Null	-7329	-7329
Log Likelihood	-6710	-6710
Degrees of Freedom	26	26
chi2	1239	1239
Pseudo R-squared	0.0845	0.0845

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

1. Regression Results: Cohort Dummies

The results show that the Post-9/11 group is 10.0 percentage points more likely to attrite than the Overlap-9/11 group holding all other variables constant. This contradicts the hypothesis that the Overlap-9/11 would be more likely to attrite. This may be explained by the fact that most reservists in the Overlap-9/11 cohort deployed with more tenure as a reservist. Most reservists deployed in support of Operation Iraqi Freedom which did not begin until March, 2003. Because the Overlap-9/11 reservists enlisted in FY (96–01) most would be in the later years of their six-year obligation and thus more mature than the Post-9/11 reservists in their first years of their obligation.

2. Effects of Deployments

Deployments to Iraq, Afghanistan and HFP areas tend to lower attrition when compared to deployments to other OCONUS areas. Reservists are 6.3 percentage points less likely to attrite if they are deployed to Afghanistan at least once, 7.3 percentage points less likely to attrite if deployed to Iraq at least once, and 4.6 percentage points less likely to attrite if deployed to a HFP area at least once. This would indicate that reservists deployed to combat areas are more likely to remain with their units until the end of their obligation.

3. Regression Results: Demographics

Demographics factors are often included in attrition models to determine if certain characteristics predict attrition better than others. By recognizing differences, leaders can adjust training programs and awareness to maximize efficiency and aid in planning. Some civilian companies have found that having on-site free child-care facilities improves work satisfaction and retention. Females entail 2.3 percent of the combined cohort population and are 6.3 percentage points more likely to attrite than their male counterparts, holding all other variables constant. This is consistent with previous research. The coefficient of age indicated a 0.4 percentage point higher probability of attrition for every year older (than the mean age). This indicates if enlistees are older when they enter, they are more likely to attrite than are younger enlistees, which is consistent with previous studies. The probability of attrition for a married reservist is 4.0

percentage points higher than for a single reservist, while the probability of attrition for divorced reservists is statistically insignificant indicating no impact compared with single reservists. Those with at least one dependent have a lower probability of attrition by 6.0 percentage points (compared to reservists who have zero dependents). When comparing race, the coefficients for African Americans and Asians were found to be statistically insignificant when compared to Whites but those in the “Other” race category (Pacific Islanders, American Indians, and people who failed to input a race), are 2.4 percentage points less likely to attrite than Caucasians. Reservists assigned to Aviation units are 4.1 percentage points more likely to attrite than those assigned Combat Arms MOS. The coefficient of the Support MOS is statistically insignificant.

4. Effects of Performance Variables

This section discusses the attrition effect of performance variables such as education level, AFQT, and proficiency and conduct scores. From previous studies, those with higher education and higher performance are expected to have lower attrition. The regression results indicate that individuals without a High School diploma are 3.2 percentage points more likely to attrite than someone with a High School diploma and those with a college degree are 1.9 percentage points less likely to attrite. Higher Proficiency and Conduct scores can also decrease the likelihood of attrition. Increasing ones Pro/Con score by 0.1 point (from 4.0 to 4.1) lowers attrition by 3.3 percentage points. Reservists with a high quality AFQT score (≥ 50) are 2.7 percentage points less likely to attrite than those with a low quality AFQT score. These results are consistent with previous literature which predicts lower attrition for those with higher aptitude.

5. Effects of Regional Dummies

The region of the country an individual lives may affect attrition due to proximity to military bases, education, political persuasion, and economics. Nine geographical regions are defined in this thesis in line with the U.S. Census designations. The Northeast region (CT, MA, ME, NH, RI, and VT) is used as the base region. Four of the regions (Mid Atlantic – (NJ, NY, PA), the Midwest states (IL, IN, MI, WI, and OH), the Southeast Central (OK, AR, TX, and LA), and the Western Mountains (AZ, NM, NV,

UT, ID, CO, MT, and WY)) produced insignificant results and thus have no difference compared with the Northeast region. One region, the Western Pacific (CA, HI, OR, WA, and AK), is 1.8 percentage points less likely to attrite compared with the Northeast. The other regions predicted a probability of attrition higher than the Northeast by varying amounts. The Western Midwest—(MO, ND, NE, KS, SD, MN, IA) are 3.0 percentage points more likely to attrite, the Southeast (KY, TN, MS, and AL) are 3.5 percentage points more likely to attrite, and the South Atlantic (FL, GA, SC, NC, VA, WV, DC, MD, and DE) are 1.9 percentage points more likely to attrite than the Northeast.

C. PROBIT ATTRITION MODEL: OVERLAP-9/11 COHORT (1996– 2001) - SAMPLE RESTRICTED TO RESERVISTS WITH OCONUS DEPLOYMENTS

The Overlap-9/11 cohort consists of the USMCR NPS enlistees with a 6X2 contract who enlisted in FY 1996 thru 2001 and deployed at least once OCONUS. The sample size is 8,670. The Overlap-9/11 population is unique because it consists of individuals who enlisted in the reserves with no expectation of mobilization or deployment. When 9/11 occurred, members of this cohort had their lives completely upended in order to help support the Global War on Terrorism as many were mobilized and deployed. The probit model to estimate the determinants of attrition is:

$$P(\text{attrite} = 1|X) = F(\beta_0 + \beta_1(\text{Deployment Variables}) + \beta_2(\text{Demographics}) + \beta_3(\text{Aptitude}) + \beta_4(\text{Regions}))$$

Table 10 displays the results of the probit regression and the marginal effects.

Table 10. Probit Attrition Model, Overlap-9/11 Cohort FY 1996–2001

VARIABLES	(1) Probit Results	(2) Marginal Effects
Deployed to AFG at least once	-0.00703 (0.165)	-0.000899 (0.0210)
Deployed to Iraq at least once	-0.477*** (0.0497)	-0.0576*** (0.00555)
Deployed to HFP area at least once	-0.240*** (0.0878)	-0.0361** (0.0153)
Age at enlistment	0.00307 (0.00986)	0.000395 (0.00127)
Gender (Female=1)	0.233* (0.131)	0.0353 (0.0230)

VARIABLES	(1) Probit Results	(2) Marginal Effects
At least one Dependent	-0.271*** (0.100)	-0.0329*** (0.0115)
Married	0.216** (0.104)	0.0296* (0.0151)
Divorced	0.0494 (0.165)	0.00658 (0.0227)
African American	-0.0742 (0.0736)	-0.00911 (0.00862)
Asian	-0.186 (0.116)	-0.0210* (0.0113)
Race is "Other"	-0.280*** (0.0704)	-0.0309*** (0.00653)
Aviation MOS	0.179* (0.105)	0.0259 (0.0170)
Support MOS	0.0147 (0.0451)	0.00188 (0.00577)
AFQT score ≥ 50	-0.0834* (0.0507)	-0.0111 (0.00701)
PRO/CON scores	-0.140*** (0.0135)	-0.0181*** (0.00174)
Non HS Diploma	0.191* (0.110)	0.0280 (0.0183)
College Degree (AA, BA, MA, PhD)	-0.0659 (0.101)	-0.00811 (0.0118)
Midwest (WI, MI, IL, IN, OH)	0.134 (0.112)	0.0185 (0.0165)
West Midwest (ND, SD, NE, KS, MN, IA, MO)	0.558*** (0.139)	0.103*** (0.0341)
Mid Atlantic (NY, PA, NJ)	0.0567 (0.112)	0.00750 (0.0153)
South Atlantic (MD, DE, DC, WV, VA, NC, SC, GA, FL)	0.221** (0.109)	0.0316* (0.0172)
Southeast (KY, TN, MS, AL)	0.171 (0.128)	0.0246 (0.0203)
SE Central (OK, TX, AR, LA)	0.205* (0.109)	0.0295* (0.0174)
Mountain (MT, ID, WY, NV, UT, CO, AZ, NM)	0.232* (0.122)	0.0345* (0.0209)
Pacific (CA, OR, WA, AK, HI)	0.0843 (0.114)	0.0113 (0.0160)
Observations	8,670	8,670
Log Likelihood Null	-2376	-2376
Log Likelihood	-2219	-2219
Degrees of Freedom	25	25
chi2	314.9	314.9
Pseudo R-squared	0.0663	0.0663

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

1. Effects of Deployments

Reservists who deployed to Iraq at least once are 5.8 percentage points less likely to attrite than those who were deployed OCONUS but did not go to Iraq. Those deployed to a HFP area are 3.6 percentage points less likely to attrite than those who did not deploy to a HFP area. Reservists who deployed to Afghanistan have no statistical significance and thus attrition is not affected. This is most likely due to only 1.6 percent of this sample was deployed to Afghanistan.

2. Effects of Demographics

Numerous variables in the demographics section of this cohort were found to be statistically insignificant including age at enlistment, divorced, African American, Asian, and the Support MOS category. The other variables remained consistent with previous findings. Females are 3.5 percentage points more likely to attrite compared with their male counterparts. Reservists with at least one dependent are 3.3 percentage points less likely to attrite compared with reservists who have no dependents. Those labeled as “Other Race” are 3.1 percentage points less likely to attrite compared with Caucasians. Reservists with an aviation MOS are 2.6 percentage points more likely to attrite compared with those in a combat arms MOS.

3. Effects of Performance

This section is also consistent with the Total cohort. Reservists with a high quality AFQT score are 1.1 percentage points less likely to attrite compared with those with a low quality AFQT score. If reservists increase their Pro/Con scores by 0.1 point, they are less likely to attrite by 1.8 percentage points. Reservists without a HS diploma are 2.8 percentage points more likely to attrite compared with those with a HS diploma.

4. Effects of Regional Dummies

Although the coefficients for the Southeast, Mid Atlantic, Midwest, and Pacific were found to be insignificant, the other regions all predict higher attrition than the Northeast region. The Western Midwest is 10.3 percentage points higher attrition than the Northeast.

The South Atlantic predicts 3.2 percentage points higher, the Central Southeast is 2.9 percentage points higher, and the Western Mountains are 3.5 percentage points higher attrition than the Northeast.

D. PROBIT ATTRITION MODEL: POST-9/11 COHORT (2002–2005) – SAMPLE RESTRICTED TO RESERVISTS WITH OCONUS DEPLOYMENTS

The Post-9/11 cohort consists of the USMCR NPS enlistees with a 6X2 contract who enlisted in FY 2002 thru 2005 and deployed at least once OCONUS. The sample size is 10,894. The Post-9/11 cohort is unique because it consists of individuals who enlisted in the reserves with full expectation of mobilization and deployment. U.S. Marines had been conducting combat operations in Afghanistan since October of 2002, and began combat operations in Iraq in March of 2003. There was never a period that Marines were not deployed in support of the Global War on Terrorism. The probit model to estimate the determinants of attrition is:

$$P(\text{attrite} = 1|X) = F(\beta_0 + \beta_1(\text{Deployment Variables}) + \beta_2(\text{Demographics}) + \beta_3(\text{Aptitude}) + \beta_4(\text{Regions}))$$

Table 11 displays the results of the probit regression and the marginal effects.

Table 11. Probit Attrition Model: Post-9/11 Cohort FY 2002–2005

VARIABLES	(1) Probit Results	(2) Marginal Effects
Deployed to AFG at least once	-0.703*** (0.128)	-0.109*** (0.0116)
Deployed to Iraq at least once	-0.327*** (0.0389)	-0.0828*** (0.0108)
Deployed to HFP area at least once	-0.240* (0.143)	-0.0614 (0.0405)
Age at enlistment	0.0294*** (0.00699)	0.00670*** (0.00159)
Gender (Female=1)	0.331*** (0.0916)	0.0877*** (0.0276)
At least one Dependent	-0.398*** (0.0820)	-0.0841*** (0.0160)
Married	0.210** (0.0841)	0.0498** (0.0209)
Divorced	-0.187 (0.115)	-0.0386* (0.0213)
African American	0.106* (0.0605)	0.0254* (0.0151)

VARIABLES	(1) Probit Results	(2) Marginal Effects
Asian	-0.0191 (0.0836)	-0.00430 (0.0187)
Race is "Other"	-0.0685 (0.0458)	-0.0152 (0.00988)
Aviation MOS	0.189*** (0.0728)	0.0468** (0.0195)
Support MOS	-0.0229 (0.0326)	-0.00523 (0.00745)
AFQT score ≥ 50	-0.173*** (0.0363)	-0.0415*** (0.00914)
PRO/CON scores	-0.206*** (0.0111)	-0.0469*** (0.00254)
Non HS Diploma	0.149** (0.0704)	0.0363** (0.0183)
College Degree (AA, BA, MA, PhD)	-0.148* (0.0755)	-0.0313** (0.0148)
Midwest (WI, MI, IL, IN, OH)	-0.0410 (0.0694)	-0.00918 (0.0153)
West Midwest (ND, SD, NE, KS, MN, IA, MO)	-0.0134 (0.0891)	-0.00303 (0.0200)
Mid Atlantic (NY, PA, NJ)	-0.109 (0.0707)	-0.0237 (0.0147)
South Atlantic (MD, DE, DC, WV, VA, NC, SC, GA, FL)	0.0655 (0.0683)	0.0152 (0.0162)
Southeast (KY, TN, MS, AL)	0.203** (0.0793)	0.0505** (0.0214)
SE Central (OK, TX, AR, LA)	0.0349 (0.0716)	0.00805 (0.0167)
Mountain (MT, ID, WY, NV, UT, CO, AZ, NM)	-0.0478 (0.0883)	-0.0106 (0.0192)
Pacific (CA, OR, WA, AK, HI)	-0.170** (0.0712)	-0.0363** (0.0143)
Observations	10,894	10,894
Log Likelihood Null	-4796	-4796
Log Likelihood	-4450	-4450
Degrees of Freedom	25	25
chi2	693.5	693.5
Pseudo R-squared	0.0723	0.0723

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

1. Effects of Deployments

Indicators of deployment to Iraq, Afghanistan, and HFP areas once again predicted lower attrition compared with those did not deploy to these areas. Reservists with Afghanistan deployments are 10.9 percentage points less likely to attrite compared with those who have never deployed to Afghanistan, holding all other variables constant. Iraq deployments are 8.3 percentage points less likely to attrite, and HFP deployments are

6.1 percentage points less likely to attrite compared with those who never deployed to a HFP area. Deploying to these dangerous areas seems to be good for retention.

2. Effects of Demographics

For every year over 20 years of age at enlistment, attrition is predicted to be 0.7 percentage points higher. Females are 8.8 percentage points more likely to attrite than their male counterparts. Reservists with at least one dependent are 8.4 percentage points less likely to attrite than those without a dependent. Married reservists are 5.0 percentage points more likely to attrite than single reservists. The coefficients of divorce, Asian, Other race, and Support MOS were all statistically insignificant. African Americans are 2.5 percentage points more likely to attrite than Caucasians. Reservists in the aviation field are 4.7 percentage points more likely to attrite compared to those with a combat arms MOS.

3. Effects of Performance

Reservists in the high quality AFQT score category are 4.2 percentage points less likely to attrite than those with a low quality AFQT score. Reservists who increase their proficiency and conduct scores by 0.1 points are 4.7 percentage points less likely to attrite. Reservists without a High School diploma are 3.6 percentage points more likely to attrite than those who have earned a High School diploma and those with a college degree are 3.1 percentage points less likely to attrite.

4. Effects of Regional Dummies

Most of the geographic regions had insignificant coefficients. Only reservists from the Southeast region and the Pacific region had significant results. The Southeast is 5.1 percentage points more likely to attrite, but those from the Pacific region are 3.6 percentage points less likely to attrite.

E. PROBIT REGRESSION RESULTS FOR UNRESTRICTED MODEL COHORTS FY (1994–2005)

The previous models did not include the Pre-9/11 cohort because the models only analyzed reservists who deployed OCONUS at least once. In this section, the Pre-9/11

cohort is included to analyze any differences related to attrition between the 3 cohorts. This model does not include deployment variables because the reservists in the Pre-9/11 cohort did not have the opportunity to deploy. The probit model to estimate the determinants of attrition for the total sample FY (1994–2005) is:

$$P(\text{attrite} = 1|X) = F(\beta_0 + \beta_1(\text{Overlap-9/11}) + \beta_2(\text{Post-9/11}) + \beta_3(\text{Demographics}) + \beta_4(\text{Aptitude}) + \beta_5(\text{Regions}))$$

Table 12 displays the probit model results in four columns. Column (1) is the total USMCR NPS population who enlisted with a 6X2 contract from FY 1994 through 2005. Column (2) includes the Pre-9/11 cohort which is all USMCR NPS marines who enlisted with a 6X2 contract in FY 1994 and 1995. Column (3) is the Overlap-9/11 cohort which includes all USMCR NPS marines who enlisted with a 6X2 contract in FY (1996–2001). Column (4) is the Post-9/11 cohort which comprises all the USMCR NPS marines who enlisted with a 6X2 contract in FY (2002–2005).

Table 12. Probit Attrition Model -- Unrestricted Sample FY (1994–2005)

VARIABLES	(1) Total 1994 2005	(2) Pre-9/11 1994 1995	(3)Overlap-9/11 1996 2001	(4) Post-9/11 2002 2005
	Marginal Effects	Marginal Effects	Marginal Effects	Marginal Effects
Overlap 9/11 Cohort (FY 96 –05)	-0.0781*** (0.00561)			
Post 9/11 Cohort (FY 02 –05)	-0.0841*** (0.00576)			
Age at enlistment	0.0146*** (0.000955)	0.0105*** (0.00277)	0.0156*** (0.00129)	0.0147*** (0.00164)
Gender (Female=1)	0.186*** (0.0111)	0.206*** (0.0375)	0.198*** (0.0147)	0.163*** (0.0191)
At least one Dependent	-0.131*** (0.00886)	-0.167*** (0.0244)	-0.130*** (0.0116)	-0.127*** (0.0163)
Married	-0.00974 (0.0105)	0.0269 (0.0309)	-0.0240* (0.0138)	0.0121 (0.0191)
Divorced	-0.103*** (0.0150)	-0.0569 (0.0510)	-0.0911*** (0.0214)	-0.128*** (0.0226)
African American	-0.0120* (0.00681)	-0.0119 (0.0168)	-0.0171* (0.00883)	0.00810 (0.0141)
Asian	-0.0716*** (0.00976)	-0.0809*** (0.0265)	-0.101*** (0.0125)	-0.0148 (0.0185)
Race is “Other”	-0.0510*** (0.00586)	-0.0718*** (0.0157)	-0.0657*** (0.00802)	-0.0228*** (0.0103)
Aviation MOS	0.0484*** (0.00919)	0.126*** (0.0248)	0.0299** (0.0123)	0.0448*** (0.0163)
Support MOS	0.0307*** (0.00452)	0.0660*** (0.0117)	0.0242*** (0.00618)	0.0264*** (0.00805)
AFQT score ≥50	-0.000878 (0.00493)	0.0308** (0.0126)	0.00277 (0.00665)	-0.0243*** (0.00908)
PRO/CON scores	-0.0700*** (0.00112)	-0.0804*** (0.00277)	-0.0603*** (0.00145)	-0.0870*** (0.00229)
Non HS Diploma	0.0288*** (0.0106)	0.0278 (0.0295)	0.0281* (0.0150)	0.0365** (0.0177)
College Degree (AA, BA, MA, PhD)	-0.0176* (0.00965)	-0.0193 (0.0248)	-0.0350*** (0.0130)	0.0163 (0.0177)
Midwest (WI, MI, IL, IN, OH)	-0.000806 (0.0103)	0.0263 (0.0270)	-0.00407 (0.0143)	-0.00746 (0.0177)
West Midwest (ND, SD, NE, KS, MN, IA, MO)	0.0434*** (0.0133)	0.0559* (0.0338)	0.0564*** (0.0187)	0.0114 (0.0225)
Mid Atlantic (NY, PA, NJ)	-0.0170* (0.0102)	0.0330 (0.0274)	-0.0220 (0.0141)	-0.0298* (0.0174)
South Atlantic (MD, DE, DC, WV, VA, NC, SC, GA, FL)	0.0441*** (0.0104)	0.0613** (0.0266)	0.0347** (0.0144)	0.0527*** (0.0180)
Southeast (KY, TN, MS, AL)	0.0462*** (0.0125)	0.0350 (0.0314)	0.0410** (0.0172)	0.0707*** (0.0226)
SE Central (OK, TX, AR, LA)	0.0293*** (0.0108)	0.0228 (0.0273)	0.0329** (0.0150)	0.0281 (0.0188)
Mountain (MT, ID, WY, NV, UT, CO, AZ, NM)	0.100*** (0.0133)	0.151*** (0.0343)	0.115*** (0.0187)	0.0561** (0.0227)
Pacific (CA, OR, WA, AK, HI)	0.0118 (0.0104)	0.0589** (0.0272)	0.0226 (0.0146)	-0.0233 (0.0172)
Observations	56,541	9,344	29,797	17,400
Log Likelihood Null	-35331	-6077	-18442	-10776
Log Likelihood	-32211	-5465	-16920	-9705
Degrees of Freedom	24	22	22	22
chi2	6239	1226	3044	2141
Pseudo R-squared	0.0883	0.101	0.0825	0.0994

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

1. Regression Results for the Full Sample of the Unrestricted Sample FY (1994–2005)

From Column (1) of Table 12, the results indicate that the Post-9/11 cohort is 8.4 percentage points less likely to attrite than the Pre-9/11 cohort and the Overlap-9/11 cohort is 7.8 percentage points less likely to attrite than the Pre-9/11 cohort holding all other variables constant. This would suggest that the events of 9/11 had a positive impact on retention related to this sample.

2. Regression Results: Demographics

Females have a consistently higher probability of attrition over their male counterparts throughout the time period. The percentage points effect decreased from 20.6 in the Pre-9/11 cohort to 16.3 in the Post-9/11 cohort indicating a 5.4 percent improvement of retention of females from the Pre-9/11 period to the Post-9/11 period. The impact of age at enlistment on attrition remained low for all three cohorts ranging from 1.1 to 1.6 percentage point higher probability of attrition for every year older (than the mean age). Having at least one dependent reduced the attrition rate, and the effect fell from 16.7 percentage point in the Pre-9/11 cohort to 12.7 percentage points in the Post-9/11 cohort. This corresponds with 6 percent higher attrition from the Pre-9/11 period to the Post-9/11 period on those with at least one dependent. The effect of being divorced was insignificant in the Pre-9/11 cohort, but in the two subsequent groups it was associated with lower attrition (by 9.1 and 12.8 percentage points in the Overlap-9/11 cohort and the Post-9/11 cohort, respectively). The effect of being married and African American were insignificant in most cohorts. The coefficient of Asian was statistically insignificant in the Post-9/11 cohort but predicted 8.1 to 10.1 percentage lower attrition in the other cohorts. The “Other” race also predicted lower attrition, but ranged from 7.2 points lower in the Pre-9/11 cohort to only 2.3 percentage points lower in the Post-9/11 cohort. This is a 12.9 percent increase in attrition for Asians from Pre-9/11 to Post-9/11. The Aviation and Support MOS reservists all predicted higher attrition than the Combat Arms MOS. The Aviation marines ranged from 12.6 percentage points higher in the Pre-9/11 cohort to 4.5 percentage points in the Post-9/11 cohort (20 percent lower attrition from Pre-9/11 to Post-9/11). The Support marines ranged from 6.6 percentage points

higher attrition than the Combat Arms MOS in the Pre-9/11 cohort to 2.6 percentage points higher in the Post-9/11 cohort (10.2 percent lower attrition from Pre-9/11 to Post-9/11). Although still higher than the Combat Arms MOS, there does appear to be a decreasing trend.

3. Regression Results: Performance Variables

This section discusses the attrition effect of performance variables such as education level, AFQT, and proficiency and conduct scores. The only variable in this section which provided solid results with all three cohorts reporting significant coefficients was the proficiency and conduct scores variable. Reservists are predicted to have between 6.0 and 8.7 percentage points lower attrition for each 0.1 increase in their pro/con scores depending on which cohort they belong. The high quality AFQT score (≥ 50) predicted mixed results with the Pre-9/11 cohort 3.0 percentage points higher, the Overlap-9/11 cohort insignificant, and the Post-9/11 cohort predicting 2.4 percentage points lower attrition than the low quality AFQT score. The education variable also had some insignificant coefficients. The non-HS Diploma variable did predict 2.8 to 3.7 percentage points higher attrition for the Overlap-9/11 and Post-9/11 cohorts compared to those reservists who had a HS diploma. The only significant result for the college degree variable was the Overlap-9/11 cohort which predicted 3.5 percentage points lower attrition than those with a HS diploma.

4. Regression Results: Regional Dummies

The region of the country an individual lives may affect attrition due to proximity to military bases, education, political persuasion, and economics. Nine geographical regions are defined in this thesis in line with the U.S. Census designations. The Northeast region (CT, MA, ME, NH, RI, and VT) is used as the base region. Four of the regions (Mid Atlantic - NJ, NY, PA), the Midwest states (IL, IN, MI, WI, and OH), the Southeast Central (OK, AR, TX, and LA), and the Western Pacific (CA, HI, OR, WA, and AK) had insignificant coefficients. Reservists located in the other regions all had a probability of attrition higher than for those in the Northeast. The Western Mountains (AZ, NM, NV, UT, ID, CO, MT, and WY) averaged 10.0 percentage points more likely

to attrite, the Southeast (KY, TN, MS, and AL) averaged 4.6 percentage points more likely to attrite, the South Atlantic (FL, GA, SC, NC, VA, WV, DC, MD, and DE) averaged 4.4 percentage points more likely, and the Western Midwest—(MO, ND, NE, KS, SD, MN, IA) averaged 4.3 percentage points more likely to attrite than the Northeast.

F. SUMMARY

In this chapter, two separate models were analyzed to determine the effects of various variables on attrition. The first model restricted the sample to only those reservists who deployed at least once OCONUS. This eliminated the Pre-9/11 cohort for analysis due to the fact that only 29 reservists (0.3 percent) in this cohort actually deployed OCONUS. This model predicted lower attrition for reservists deployed to Afghanistan, Iraq, and HFP areas compared to reservists who deployed OCONUS but did not operate in these areas.

The second model included the unrestricted sample of reservists in order to capture determinants of attrition with the Pre-9/11 cohort. The model predicted lower attrition for the Overlap-9/11 and Post-9/11 cohorts compared to the Pre-9/11 cohort. When comparing the two models on demographics, both predicted increased attrition for the older age at enlistment, females over males, married vice single, and aviation MOS over combat arms MOS. Both models also predicted lower attrition for reservists with at least one dependent, and those whose race was “other” compared to Caucasians. The African American, Asian, divorced, and support MOS variables were inconsistent with at least one of the models producing insignificant results with those variables.

When comparing the education and aptitude variables between the two models, only the Pro/Con variable consistently predicted significant and similar results. Both models predicted lower attrition with an increase in the Pro/Con scores. The other variables were inconsistent when comparing the two models. Because the coefficients were insignificant in at least one of the models, the effects are inconclusive.

The geographic regions mostly proved to be inconsistent or insignificant when comparing the two models. Three areas did coincide with the two models and produce significant coefficients; the Western Midwest, South Atlantic, and the Southeastern regions. These three areas all predicted higher attrition than the Northeast in both models.

VI. CONCLUSION AND RECOMMENDATIONS

A. REVIEW

The goal of this thesis was to determine the determinants of attrition on USMCR NPS marines with a 6X2 contract who enlisted from 1994 through 2005. The analysis revolved around the events of September 11, 2001 to determine if characteristics of the population were different before and after the terrorist attacks on the American homeland. The population was divided into three cohorts; the Pre-9/11 cohort enlisted in FY 1994 and 1995 and completed their six-year obligation prior to 9/11, the Overlap-9/11 cohort enlisted between FY 1996 and 2001 (before 9/11) and whose 6-year commitment expired sometime after 9/11, and the Post-9/11 cohort which enlisted in FY 2002–2005 after 9/11. Numerous variables were analyzed, these included deployment characteristics, demographics, education and aptitude, and regional differences.

The data on the reservists was collected from the TFDW, MCRISS, and the Bureau of Labor and Statistics. Monthly snapshots of each reservist were collected to form a panel dataset consisting of over 3.5 million observations from the years 1994–2011. The data was then compiled, combined, and compressed to keep only the last observation of each reservist. This presented an overall picture of the reservists characteristics as well as made it possible to determine if the individual completed their 6-year obligation or if they left the reserves early as an attrite.

A thorough literature review was performed in Chapter II including previous studies on active duty and reservists in all the United States armed forces with an emphasis on the Marine Corps. Many of the hypotheses of this thesis were derived from the literature review. Chapter IV presented the Descriptive Statistics. Two different models using two different data samples were analyzed. The first model was a restricted model to measure the effects of deployment on attrition. It used only those reservists who deployed OCONUS. Because reservists in the Pre-9/11 cohort did not have the opportunities to deploy, the cohort was omitted from analysis in the first model due to lack of observations. The second model included all three cohorts, but did not include

the deployment variables. This allowed analysis to compare the difference in behavior between the three cohorts and determine characteristics which may have changed from before to after 9/11. Chapter V performed the data analysis of the two models using probit regressions and then compared the results to determine the significance of the results. If both models produced similar results, it can be inferred that the outcome is credible.

B. RESULTS AND FINDINGS

Attrition has declined from 36.1 percent in the Pre-9/11 cohort to 30.1 percent in the Post-9/11 cohort. The events of 9/11 seem to have lowered attrition rates. This is most likely explained by deployments and the unemployment rate. Reservists who deployed to Afghanistan, Iraq, and HFP areas were consistently found to be less likely to attrite than those reservists who deployed OCONUS but did not participate in these areas. This indicates that deploying in support of the Global War on Terrorism decreases attrition. It is not clear whether the attrition is lower due to the individuals' needs or the Marine Corps needs. Individuals may have an increased sense of purpose and desire to support and defend the United States and thus stick with their obligation, or it could be the Marine Corps reluctance to let people go due to necessity of deployment requirements. Either way, the attrition is lower due to deployments. Another factor in lower attrition after 9/11 is an increased unemployment rate. The unemployment rate for individual reservists averaged 4.5 percent in the Pre-9/11 cohort and then increased to 7.0 percent for the Post-9/11 cohort. Previous studies have all found lower attrition rates are correlated with higher unemployment rates due to lack of opportunity in the civilian sector. Further analysis is needed to determine how much impact the unemployment rate had on attrition of this population of reservists.

The effects of reservist's demographic characteristics were mostly consistent with the previous literature. However, one exception is the finding that reservists with at least one dependent have lower attrition. The previous literature predicts higher attrition for those with more dependents. Women continue to have higher attrition than men, but there is evidence that after 9/11 the percentage rate decreased indicating an improvement. Many of the results for minorities were insignificant, but when the results were

significant, they indicated lower attrition for minorities than Caucasians, which coincides with previous studies. Reservists with an Aviation MOS are more likely to attrite than those with a combat arms MOS but the rates decreased from Pre-9/11 to Post-9/11 indicating improvement in this group. The education, aptitude, and regional variables also produced a combination of insignificant coefficients or expected results. The strongest supported finding was increased pro/con scores predict decreased attrition which was expected.

C. RECOMMENDATIONS

Attrition in this thesis was calculated using panel data collected over the course of an individual reservist's six-year enlistment. Because many intended data fields were incomplete or blank, the only accurate way to determine attrition was to analyze the reservist's last data entry and determine how many months he or she had left on their contract. If the reservist failed to complete their six-year commitment, they were determined to be an attrite. The data fields indicating why a reservist separated was often left incomplete, so there was no way of knowing why the individual separated. There are many reasons why a reservist separates early. Some reasons are negative such as due to misconduct, legal, or medical issues, whereas other separations may not actually constitute a loss to the Marine Corps such as a transfer to a different unit, to the active duty, or to an officer program. In this thesis, there was no way to determine acceptable unit attrition (losses to other reserve or active units) from negative attrition (losses to civilian life). Future research should try to restrict the analysis to the negative attrition (losses to civilian life).

Although the increased unemployment rates from Pre-9/11 to Post-9/11 have impacted attrition, we are unsure by how much. Future studies could attempt to determine the quantitative impact of changes in the unemployment rate on attrition over this period.

In January of 2007, Marine Corps Commandant, General James T. Conway issued ALMAR 002/07 EVERY MARINE INTO THE FIGHT- COMMANDANT'S INTENT (Conway, 2007). The guidance was to get every Marine to the fight at least once. In this

study, it was determined that deploying to combat decreases attrition. Not only was the Commandant trying to decrease the burden on Marines with multiple deployments by implementing this policy, but he was also decreasing attrition. This is a good policy and should continue for future conflicts.

In summary, Americans enlist in the Marine Corps knowing the risk of going to war. The Marine Corps has a reputation of being the first to fight. The results in this thesis suggest that deployment to conflict areas is associated with lower attrition. As the involvement in Iraq and Afghanistan wind down and the economy improves, there is a real possibility of increased attrition back to Pre-9/11 levels. It is imperative that the USMCR leadership recognizes the challenges ahead and implements policies, training, and recruiting efforts to anticipate these dynamics.

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